LOGAN CITY
WASTEWATER TREATMENT FACILITIES

ENVIRONMENTAL ASSESSMENT

NOVEMBER 2015

PREPARED FOR:

UTAH DIVISION OF WATER QUALITY

LOGAN CITY UNITED IN SERVICE

Table of Contents

APPENDICES

List of Figures

List of Tables

Acronyms

APE	Area of Potential Effect
BMP	Best Management Practices
CEQ	Council on Environmental Quality
DWQ	Division of Water Quality (Utah)
EA	Environmental Assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
LEDPA	Least Environmentally Damaging Practicable Alternative
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NOI	Notice of Intent
Phase 1 ESA	Environmental Site Assessment
RAS/WAS	return activated sludge/waste activated sludge
SHPO	State Historic Preservation Office (Utah)
SWPPP	Storm Water Pollution Prevention Plan
TMDL	Total Maximum Daily Load
UDAQ	Utah Division of Air Quality
UDWR	Utah Division of Wildlife Resources
ULT	Ute Ladies'-tresses
UNHP	Utah Natural Heritage Program
UPDES	Utah Pollutant Discharge Elimination System
USACE	United States Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
UV	ultraviolet

1.0 PURPOSE AND NEED FOR THE PROPOSAL

1.1 Introduction and Project Description (Proposed Action)

The City of Logan (City) owns and operates a lagoon system that provides wastewater treatment for the city and the surrounding communities of Hyde Park, Nibley, North Logan, Providence, River Heights, and Smithfield, as well as Utah State University. See Figure 1 – Project Location Map. The lagoon system includes floating aerators that provide the oxygen required for microbes to break down the waste, a large detention volume for solids settling, and a chlorine addition for disinfection of pathogens before discharging treated effluent for irrigation use. Approximately 15 million gallons of wastewater are treated and released from the lagoons each day. The treated effluent from the facility discharges to the Cutler Reservoir.

This facility was identified as a point source discharge to Cutler Reservoir, and as such, the City received notification of a new limit on total effluent phosphorus that must be met by 2020 as part of a new total maximum daily load (TMDL). See the Middle Bear River and Cutler Reservoir TMDL (Cutler Reservoir TMDL). The City must reduce the mass of phosphorus discharged from their facility by approximately 75 percent to meet the annual load limit, which results in a total phosphorus effluent concentration of approximately 1.0 milligrams per liter or less. The lagoon system as currently configured is not capable of meeting the total phosphorus limit imposed by the TMDL.

Additionally, the City is required to reduce ammonia levels as a result of a new toxicity standard promulgated by the EPA and enforced by the Utah Division of Water Quality (DWQ). The new standards require that average effluent ammonia be less than 3.0 mg/L during winter months and less than 1.3 mg/L during summer months. The lagoon system as currently configured, along with existing wetland polishing cells constructed by the City in 2004, do not provide sufficient ammonia removal for the City to meet this new standard. In January 2103, DWQ formally notified the City of the new proposed ammonia limits and asked that facility updates to address phosphorus be expanded to include ammonia removal. See the correspondence from the DWQ attached.

Numerous treatment technologies and alternatives were evaluated to determine the most cost effective solution for the City to meet the new limits for phosphorus and nitrogen. A bioreactor process followed by chemical addition and filtration for phosphorus removal was recommended as the preferred treatment alternative. The proposed action would construct a three-stage Bardenpho bioreactor mechanical treatment facility. Proposed new facilities are as follows: a new headworks with grit removal, bioreactors with anoxic zones to allow for nitrogen removal (nitrification and denitrification), secondary clarifiers, return and waste activated sludge (RAS/WAS) pumping facility, tertiary filters with chemical addition for phosphorus removal, and ultraviolet (UV) disinfection.

1.2 Location of the Project Area

The project area is located in Logan, Cache Valley, Utah, just south of the existing wastewater treatment facilities. The project area is approximately 63 acres, bounded by the Logan Wastewater Treatment Facility on the north, 200 North on the south, 2200 West on the east, and 2600 West on the west. See Figure 1 – Project Location Map. At this time it is estimated that only about 30-32 acres of the site would be disturbed by either re-grading or construction. The remaining land would remain undisturbed.

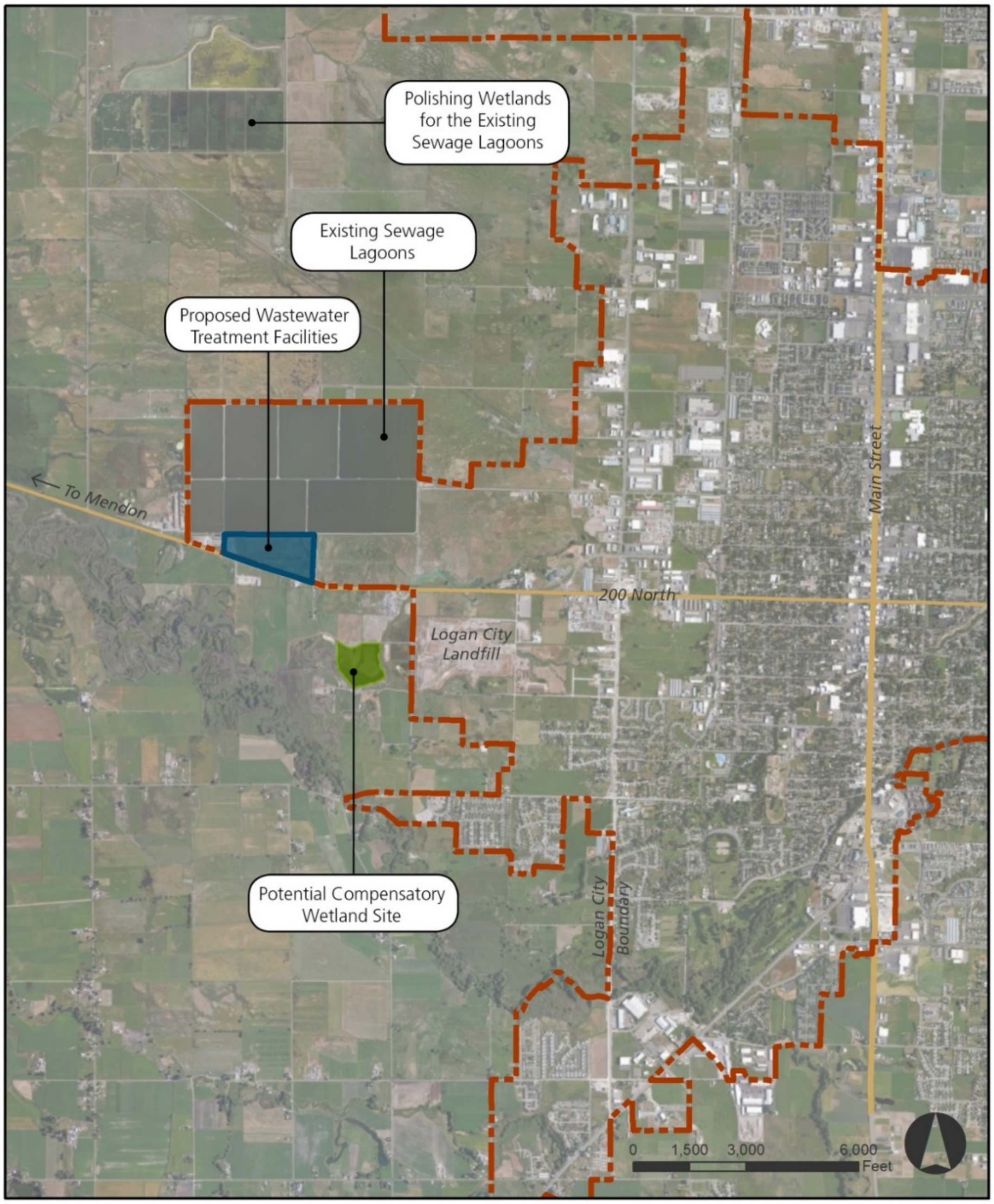

Figure 1. Project Location Map

1.3 Purpose and Need of the Proposed Action

The purpose of the project is to provide wastewater treatment facilities capable of complying with the new environmental effluent standards for phosphorus and ammonia. The project is needed due to the inability of the existing wastewater treatment facilities to meet these standards. These needs were documented in the Logan City Wastewater Treatment Master Plan Update 2013 (2013 Updated Plan).

In 2010, the DWQ identified Cutler Reservoir as being impaired due to low dissolved oxygen concentrations and excess total phosphorus. A TMDL study for Cutler Reservoir resulted in limits to the amount of phosphorus that point and non-point source dischargers might contribute to the system in an effort to protect the beneficial uses of the water body. The Cutler Reservoir TMDL was approved by the EPA and the DWQ has allocated the TMDL to individual point source dischargers, resulting in a limit on the amount of total phosphorus that can be discharged and a compliance schedule for upgrading treatment facilities. The City's existing lagoon wastewater treatment facility was identified as a point source discharge to Cutler Reservoir; therefore, the City received notification of a new limit on total effluent phosphorus. The lagoon system is not capable of meeting the total phosphorus limit imposed by the TMDL, regardless of the disposal method (irrigation or direct discharge).

Table 1. Existing and Future Effluent Limits for Phosphorus

Season	Previous Mass Limit	New Mass Limit*
May through October	NA	11,487 kg
November through April	NA	12,901 kg

Source: Wastewater Treatment Master Plan Update 2013
**Based on Discharge Compliance at 001 monitoring point*

Further, in late 2012, EPA changed the ammonia toxicity standard for point source discharge to receiving waters. As a result, DWQ determined that the proposed changes to the City's existing lagoon wastewater treatment facility would also need to address the ammonia toxicity standard to include a chronic ammonia limit in addition to the acute ammonia limit. Currently, the City has 180 acres of polishing wetlands for ammonia removal after lagoon treatment. However, the polishing wetlands cannot provide sufficient ammonia removal to meet the lower limits implemented by the DWQ.

Table 2. Existing and Future Effluent Limits for Ammonia

Season	Winter	Spring	Summer	Fall
Expected Ammonia Limit				
Monthly Average	3.0	3.0	1.3	2.6
Daily Maximum	5.0	8.0	6.0	7.0
Current Ammonia Limit				
Daily Maximum	14.4	11.9	9.1	11.2

Source: Wastewater Treatment Master Plan Update 2013

1.4 Purpose of the Environmental Assessment

This Environmental Assessment (EA) discusses the environmental resources in the project area; evaluates the effects of the alternatives identified on the environmental resources, if any; and proposes measures to avoid, minimize, or mitigate any adverse effects to being less than significant. This EA is in compliance with the National Environmental Policy Act (NEPA) and provides full public disclosure of the effects of the Proposed Action.

2.0 ALTERNATIVES

2.1 Existing Facilities

The existing treatment facility consists of a series of seven cells for wastewater treatment equipped with pontoon-mounted surface aerators, a mechanical headworks facility and chlorine contact basin, and a series of wetlands intended to enhance ammonia removal. See Figure 1 – Project Location Map.

2.2 No Action Alternative

The No Action Alternative assumes that the existing lagoons and polishing wetlands would continue to be used for wastewater treatment. The No Action Alternative would not provide facilities sufficient to be able to meet the new standards for effluent phosphorus or ammonia. The City would be out of compliance with the TMDL imposed by the DWQ on the City as a point source polluter of the Cutler Reservoir.

The No Action Alternative does not meet the purpose and need for the project; however it will be included in this study as a baseline to compare the environmental impacts of the Proposed Action, in compliance with NEPA.

2.3 Proposed Alternative

The City recently purchased property adjacent to their existing lagoon system that was used by the previous owner for livestock grazing. The proposed new facilities overlay the former grazing area on the east and shooting range on the west. The shooting range is owned and operated by the City for police department training and would be abandoned to make way for the wastewater project. Construction activities for the new mechanical treatment facilities will include construction of the large concrete basins for the biological and settling processes, new enclosed buildings for the headworks, secondary sludge pumping (i.e., return activated sludge/waste activated sludge (RAS/WAS) pumping), and joint facility for the filters and UV disinfection. Additionally, there will be yard piping installed to connect the new and existing facilities, and aged equipment in the existing headworks facility will be replaced. The location of both the existing and new facilities within the Cache Valley is shown in Figure 2 – Proposed Action.

The Proposed Action would construct a three-stage Bardenpho bioreactor mechanical treatment facility, which would be constructed in phases and include the following components in Phase 1 (see Figure 2 – Proposed Action):

- Headworks facility building for screening trash and other debris from incoming wastewater
- Influent pump station building and covered equalization tanks
- Six (6) 1.5 million gallon bioreactor basins for aeration, mixing, and treatment
- Six (6) 90-foot diameter secondary clarifier basins for the solids settling
- Solids return and waste pump-station building to transfer solids from secondary clarifiers back to the bioreactors and waste to the solids holding tanks
- Two (2) 50-foot diameter solids holding tanks to hold waste solids prior to mechanical dewatering
- Tertiary filter building to filter water and disinfect with ultraviolet (UV) light
- Solids dewatering building to mechanically dry solids, return liquid to wastewater treatment process, and truck out dry solids by way of a pull through truck bay
- Odor control building with fans and granular activated carbon towers for collection and destruction of foul air
- Installation of a 54" HPDE SRS 21 pipeline to reroute the wastewater from its current input point to the new facility
- Access roads, parking, sidewalks/walkways between facilities, required security fence, minor landscaping
- Administration building to house office space, personnel training rooms, laboratory, and a public education demonstration area
- Main electrical building that will contain the power service drop for site operations
- Ancillary electrical facilities varying in size from small buildings to small electrical boxes or vaults

Future phases would include the following components:

- Four (4) 100-foot diameter primary clarifier basins to capture primary solids for digestion
- Solids thickening building to thicken solids and reduce water before solids enter anaerobic digesters
- Four (4) 50-foot diameter enclosed anaerobic digester tanks
- Two (2) bioreactor basins for aeration, mixing, and treatment
- Two (2) 90-foot diameter secondary clarifier basins for the solids settling
- Cogeneration building to house generators to burn bio-gas from the digesters for supplemental power generation
- Ancillary electrical facilities varying in size from small buildings to small electrical boxes or vaults

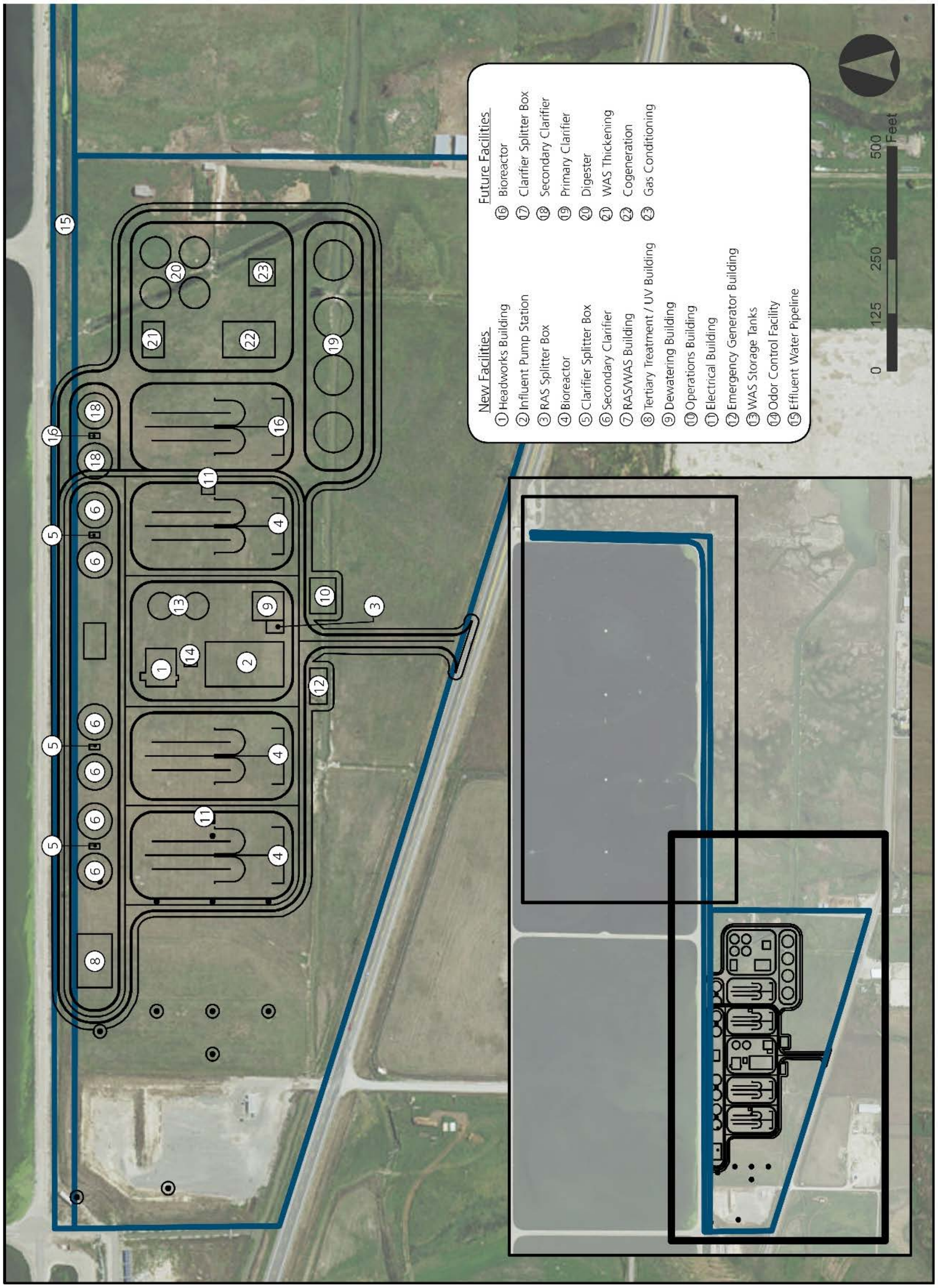

Figure 2a. Proposed Action

Figure 2b. Proposed Action

<u>Preconstruction Activities</u>

Permits: Prior to initiation of construction, the contractor would be required to obtain all Federal, State, and local permits and approvals necessary to perform the work, including those related to surface area disturbance, stormwater discharge, air quality, and traffic safety.

Staging and mobilization: The project will begin with top soil stripping and stock piling, followed by the importation of structural fill over the site area for new and future facilities. The structural fill will provide a work surface for pile driving and facilities construction. Staging areas and equipment storage will occur on the area of future facilities located on the east side of the site. Site access will be from SR-30 at the intersection with 2600 West. Concurrently, work will begin at the proposed constructed wetland site in order to mitigate impacts to wetlands and Waters of the U.S. Project construction will progress in general phases of site preparation and pile driving operations, to concrete and masonry building construction, electrical and mechanical equipment installation, and facility start-up.

Construction details: The conceptual site plans call for construction of the new treatment facilities upon piles and imported fill at an elevation similar in height as the existing lagoon embankments. Building facilities on the piles will address concerns regarding soft underlying native soils and allow mechanical facilities to operate at a hydraulic similar to the existing lagoon system. Top soils will be stripped and preserved during early construction activities and will be used to dress and landscape embankments that may be visible from State Route 30.

Borrow, Stockpiling, and Disposal: Project will require importation of structural fill from a local gravel pit that has not yet been identified. Top soil will be stripped and stockpiled from the project area and reused for finished improvements, but no borrowing or disposal of existing soils is anticipated.

Construction Schedule: The project is anticipated to require four years of construction as outlined in the following implementation schedule, as required by the July 2015 permit issued by the UDWQ. The facility will be complete and online by 2020. See Table 3.

Table 3. Implementation Schedule

	2015				2016				2017				2018				2019				2020			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Master Plan Approval																								
Project Design																								
Project Review/Approval																								
Bid Period/Award																								
Construction																								
Startup/ Optimization																								

Demobilization and Clean-up: Project will conclude with final grading and paving, landscaping, facility start-up and testing and removal of temporary construction facilities such as administrative trailers.

Operation and Maintenance: Logan City staff will operate the facility and perform routine maintenance as required to provide high quality wastewater effluent which complies with new standards for phosphorus and ammonia.

2.4 Alternatives Eliminated from Consideration

Alternatives that were considered but eliminated from consideration included other mechanical wastewater treatment plant types as follows:

Bio-Domes with Tertiary Treatment

Under this alternative, large domes would be added to the existing lagoons to facilitate ammonia removal. This alternative would require phosphorus filtration and other facilities to be placed on land outside of existing lagoons and would require additional property adjacent to or in close proximity to the lagoons. This alternative was eliminated since bio-dome researchers have limited data that shows the technology is capable of sufficiently reducing ammonia levels at winter time temperatures. This alternative would not meet the purpose and need for the project in that it would not be a reliable method for achieving compliance with the new water quality standards. Additionally, the number of bio-domes and linear feet of air hose that would be required to connect the domes all together made this alternative very expensive.

Algae Treatment

Under this alternative, new shallow ponds would be constructed for algae growth and treatment. The new ponds would require a greenhouse type facility to be constructed over the top of them in order for this alternative to be viable during winter months. This alternative would also require additional property adjacent to or in close proximity to the lagoons. This alternative was eliminated since algae treatment is severely limited during winter-time conditions. This alternative would not meet the purpose and need for the project in that it would not be a reliable method for achieving compliance with the new water quality standards. Also, an area larger than the current lagoons would have to be covered with greenhouses (approximately 900 acres), which would make this alternative the most expensive and the most impractical.

Conventional Activated Sludge

This alternative would require multiple basins for biological ammonia and phosphorus removal and would require additional property adjacent to or in close proximity to the lagoons. The overall footprint would be approximately 1/3 larger in size in comparison to the Proposed Action, which would result in the destruction of a larger amount of wetlands and would therefore not qualify as the Least Environmentally

Damaging Practicable Alternative (LEDPA). Further, the cost would be $30 million more than the Proposed Action.

Smaller Bardenpho Bioreactor

An option was reviewed in which the capacity of the Bardenpho bioreactor would be reduced and the lagoons would be utilized in parallel with the new treatment facility to treat the remainder of the flow. However, the amount of land that would be needed to provide adequate storage capacity for the lagoons and for the land application that would be needed for phosphorus uptake (approximately 400 acres) make this option cost prohibitive.

Alternative Sites

Potential sites located away from the existing facilities were also considered, but dismissed due to unnecessary costs and potential wetland impacts. Sites located away from the existing facilities would require the relocation and reconstruction of the existing sewer pipelines that feed into the lagoon system to the new site. This work would add project costs that could be avoided, create a need for a much larger footprint at the new site to replace some of the existing facilities that would be abandoned (thus requiring a greater cost for additional land acquisition), and collectively would likely cause greater wetland impacts that those that may occur adjacent to the existing lagoons.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Resources Not Considered in Detail

The following resources were eliminated from consideration based upon not being present in the project area or are not anticipated to have any impacts: right-of-way and relocations; pedestrian and bicycle, and wild and scenic rivers.

3.2 Land Use/ Prime, Unique, and Statewide Important Farmland

Affected Environment

The project area is currently zoned for Public and Commercial Service use, according to the City's Official Zoning Map dated February 4, 2014, as well as being contained within the Gateway and Landfill overlay zones. See Figure 3 – Logan City's Zoning Map. The Logan City Landfill, which is located within the vicinity of the project area, is currently being capped and the overlay zone is not included in the future plans for the area. According to the General Plan, future land use for the area include Public and Gateway classifications. See Figure 4 – Logan City's Future Land Use Map. According to the Natural Resources Conservation Service (NRCS), the majority of the project area consists of farmland of statewide and local importance, with a small percentage being classified as prime farmland if irrigated.

Environmental Consequences

Basis of Significance: An alternative would be considered to potentially have a significant adverse effect on farmland resources if it would convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, (2) conflict with existing zoning for agricultural use, or (3) involve other changes in the existing environment which, due to their location or nature, could result in the conversion of farmland to non-agricultural use. An alternative would be considered to potentially have a significant adverse effect on land use if it would (1) physically divide an established community; (2) conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project; or (3) conflict with any applicable habitat conservation plan or natural community conservation plan.

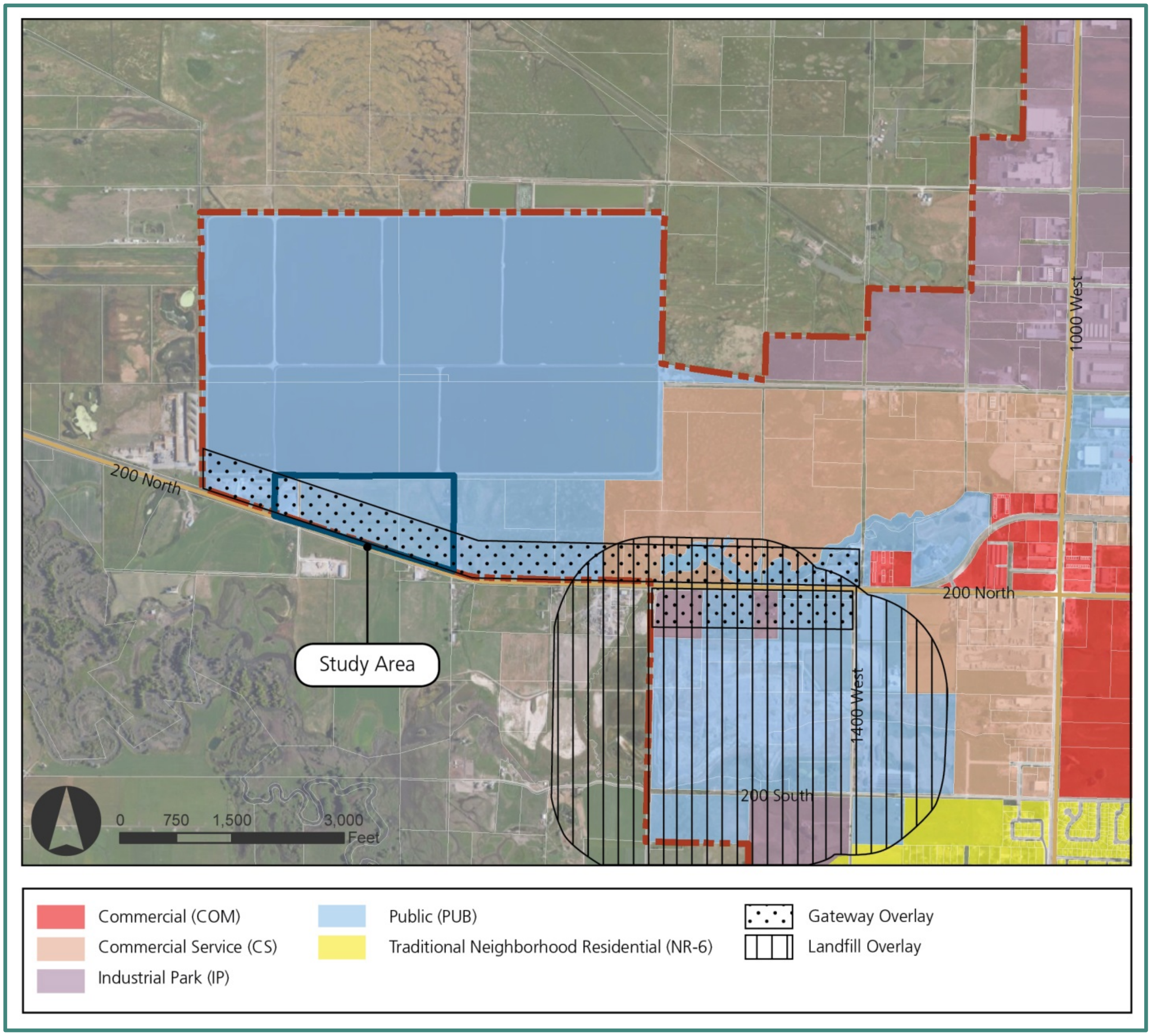

Figure 3. Logan City's Zoning Map

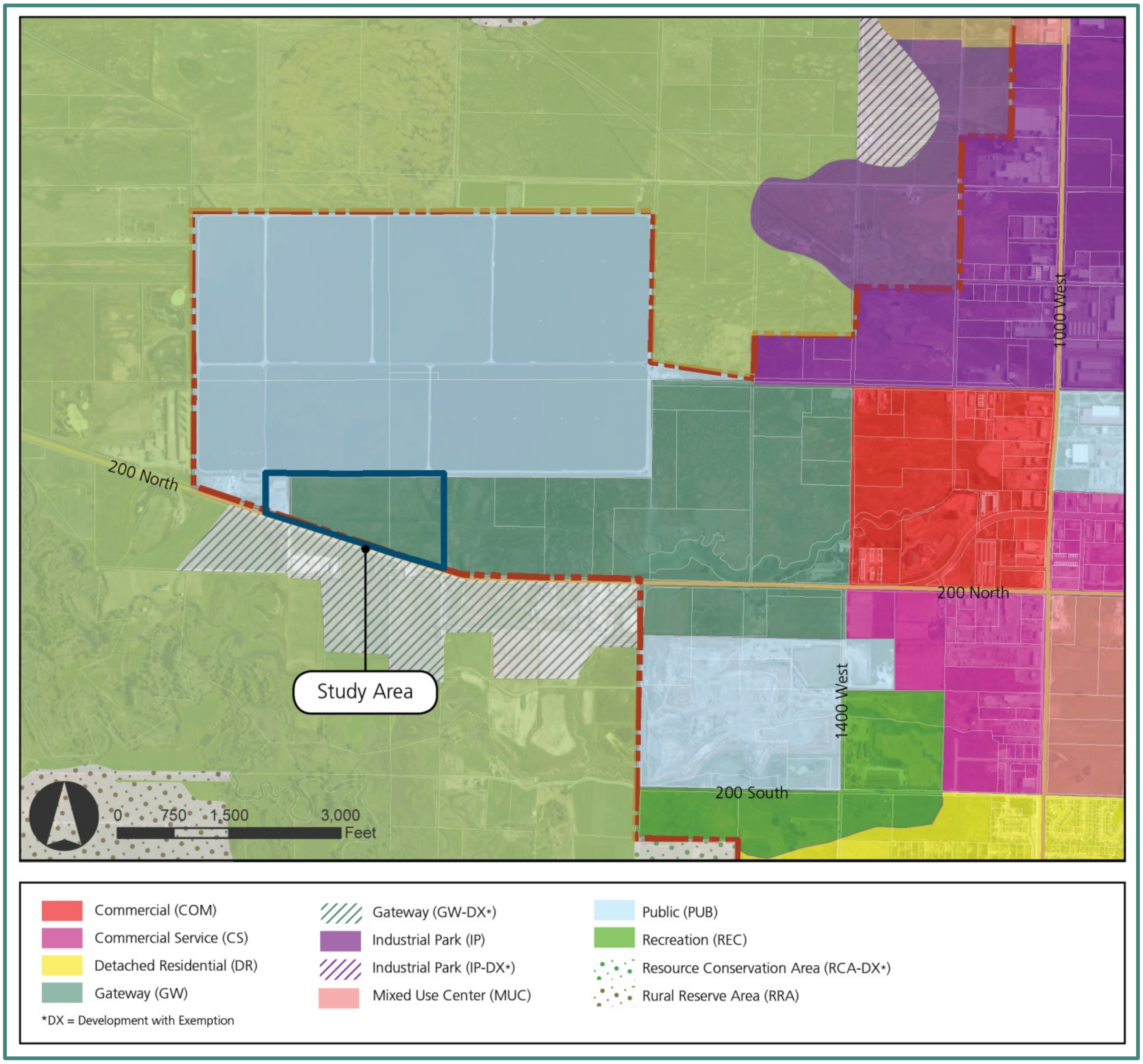

Figure 4. Logan City's Future Land Use Map

No Action Alternative

Under the No Action Alternative, there would be no construction activities and no improvements made to the existing wastewater treatment facility. Therefore, there would be no impacts to prime, unique or statewide important farmland. The current use is compatible with the Public and Commercial Service zoning classification; albeit somewhat incompatible with the Gateway designation.

Proposed Action Alternative

The Proposed Action would be compatible with the Public land use classification for the project area, as shown in both the existing zoning map and the future land use plans. In regards to the future land use plans, measures will be taken to screen the facility from the roadway, using berms, landscaping treatments, etc. to present an inviting and attractive viewshed to welcome visitors to Logan City and to make the facility not incompatible with the Gateway designation.

Under the Proposed Action Alternative, approximately 32 acres of farmland that is classified as farmland of statewide importance will be directly impacted by the construction of the proposed new treatment facility. The conversion of farmland for use in the wastewater treatment facility would be a permanent conversion of farmland to non-agricultural use. Since the project area is not located within the Logan Urban Area as classified in the 2010 Census data, consultation with the NRCS was undertaken regarding potential impacts and a Farmland Conversion Impact Rating form was completed. The area reviewed by the NRCs was larger than what was finally selected as the site, consisting of 62 acres. See the letter from the NRCS dated June 25, 2014 and the NRCS Form AD-1006 attached.

Upon completion of the Form, the proposed project had an impact rating of 157, which is less than the 160 points that would indicate an adverse impact to farmlands sufficient to require the consideration of avoidance and mitigation alternatives. This project would also not impact adjacent farmland or other impact the daily operation of agricultural activities or farm support services in the area.

Mitigation

Measures will be taken to screen the facility from the roadway, using berms, landscaping treatments, etc. to present an inviting and attractive viewshed to welcome visitors to Logan City. No mitigation is required for farmland impacts.

3.3 Cultural Resources

Affected Environment

In accordance with Section 106 of the National Historic Preservation Act (NHPA) and the Utah Historic Preservation Act (U.C.A. §9-8-102 et seq.), potential impacts or the Proposed Action on historic resources were considered. The Area of Potential Effects (APE) for the project consists of a 62.9 acre 925.45 hectare) parcel in Logan, Cache County, Utah. The boundaries of the parcel include the Logan Wastewater Treatment Facility on the north, 200 North on the south, 2200 West on the east, and 2600 West on the west. See Figure 5 – Cultural Resources. A selective reconnaissance-level survey of historic buildings was conducted in connection with this project, as well as an archaeological survey. See *A Selective Reconnaissance-Level Survey of Architectural Resources for the Logan Wastewater Treatment Facility Project, Logan, Cache County, Utah* and *An Archaeological Resource Investigation of the Logan Wastewater Treatment Facility Project, Logan, Cache County, Utah* in Appendix A.

For architecture, one property was identified in the APE, located at approximately 250 North 2300 West, including two buildings constructed within the historic era (during or before 1963), but it is recommended as **ineligible** for the National Register of Historic Places (NRHP) due to its substantial lack of integrity.

For archaeology, the survey resulted in the observation of one site: 42CA178, the Cow Pasture Canal, which runs through the center of the parcel from east to west and includes several secondary canals and ditches and several features (i.e. diversion structures and culverts). This site was determined to be **not eligible** for the NRHP. Although it retains good integrity, it is not an important contributor to agricultural or other development of Logan or Cache County. It is not associated with important trends or events in local, regional, or national history, has no association with important persons, does not represent a particular style or solve a difficult engineering problem in the area observed and would not yield important information if excavated. One isolated occurrence (a ditch with connection to the Cow pasture Canal or any other ditch or canal) was also recorded. The new pipeline alignment is excluded from the APE since the area in which it would be located has been previously disturbed.

Native American tribes that may have an interest in the area were contacted to inform them about the proposed project and to solicit their participation in this evaluation at whatever level they deemed appropriate. Letters dated August 26, 2015, were sent to the Eastern Shoshone Tribe of the Wind River Reservation, the Shoshone-Bannock Tribes of Fort Hall, the Paiute Indian Tribe of Utah, the Northwestern Band of Shoshone Nation, the Ute Indian Tribe of the Uintah and Ouray Ute Indian Reservation, the Skull Valley Band of Goshute Indians, the Confederated Tribes of the Goshute Reservation, the Cedar Band of Paiutes, and the Shivwits Bank of Paiute Indian Tribe of Utah. No written responses to the letters were received. Copies of the correspondence sent out are attached. A verbal inquiry was made by the Shoshone-Bannock Tribes of Fort Hall, but no further responses were received.

Environmental Consequences

Basis of Significance: An alternative would be considered to potentially have a significant adverse effect on cultural resources if it would adversely affect properties listed on, or eligible for listing on, the National Register of Historic Places (NRHP). Types of potential effects include physical destruction, damage, or alteration; isolation or alteration of the character of the setting; introduction of elements that are out of character; neglect; and transfer, lease or sale.

No Action Alternative

Under the No Action Alternative, there would be no impacts to cultural resources since no cultural resources that would be eligible for the NRHP were identified in the project area. Further, there would be no construction activities under this alternative. The No Action Alternative would result in a finding of **No Historic Properties Affected**.

Proposed Action Alternative

The Proposed Action Alternative would not have any impact on cultural resources since no eligible resources were documented in the project area. Therefore the Proposed Action would result in a finding of **No Historic Properties Affected** for cultural resources.

Consultation with the Utah State Historic Preservation Office (SHPO) was undertaken by the Utah DWQ, with concurrence on the eligibility and effect determinations being received. See the SHPO concurrence letter dated November 7, 2013 attached.

Mitigation

No mitigation is required.

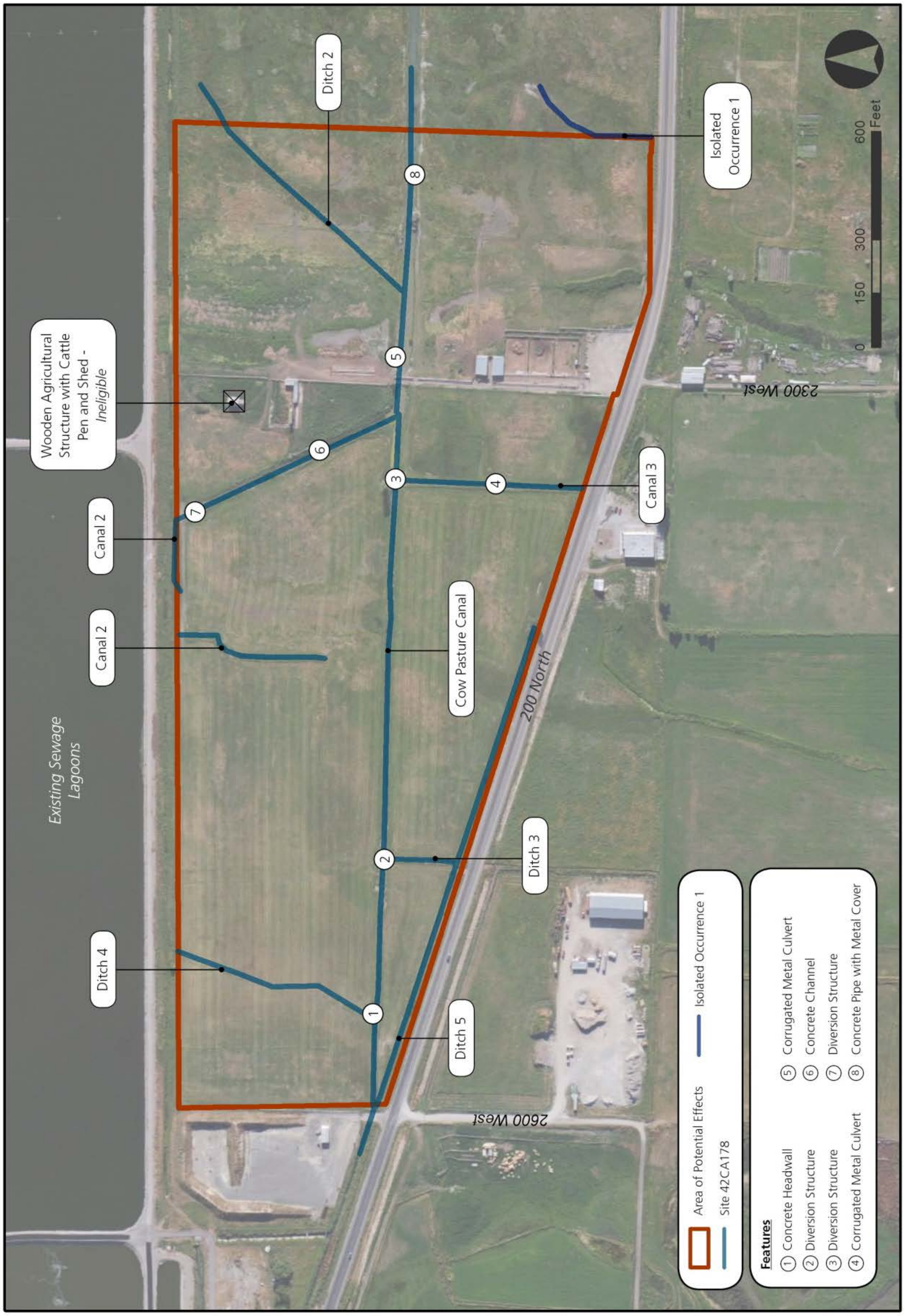

Figure 5. Cultural Resources

3.4 Biological Resources

Affected Environment

Threatened and Endangered Species

The Endangered Species Act (ESA) provides protection to Federally-listed threatened and endangered species and their designated critical habitats and is under the jurisdiction of the United States Fish and Wildlife Service (USFWS).

On October 26, 2015, an official species list was obtained from the USFWS' Information Planning and Conservation (IPaC) database. The official species list identified the yellow-billed cuckoo, the Ute ladies'-tresses, and the Canada lynx as potentially being present in the project area, but did not identify any critical habitats for any of those species within the project area. See Appendix B. Exact species localities of federally-listed ESA species known to occur within and adjacent to the project area were obtained from the Utah Natural Heritage Program's (UNHP) database.

Table 4. Threatened, Endangered, and Candidate Species Protected Under the ESA

Common Name	Scientific Name	Status
Plants		
Ute Ladies' Tresses (ULT)	*Spiranthes diluvialis*	Threatened
Mammals		
Canada Lynx	*Lynx canadensis*	Threatened
Birds		
Yellow-billed Cuckoo	*Coccyzus americanus*	Threatened

Source: U.S. Fish and Wildlife Service Official Species List dated October 26, 2015

On July 18, 2013, Ryan Pitts and Nicole Tolley with Horrocks Engineers conducted presence/absence surveys for federally-listed ESA species listed by the USFWS for Cache County as of April 2, 2013, which included the Maguire primrose (*Primula maguirei)*, the greater sage-grouse (*Centrocercus urophasianus*), and the least chub (*Iothichthys phlegethontis*). Greater sage-grouse have since been removed from the Endangered Species List and the Maguire primrose and the least chub were not identified in the official USFWS list for the project area. In addition, vegetation type, hydrology, soil characteristics, and general biological observations were recorded throughout.

Wildlife and Vegetation

The project area is located in undeveloped agricultural land adjacent to a roadway on the south and east and to the existing wastewater lagoons on the north. According to a previous Preliminary Wetland Delineation prepared for the project area in November 2012, vegetation in the area consists of common threesquare, hardstem bulrush, cattail, common spikerush, Nebraska sedge, reed canary grass, salt grass, meadow fescue, clustered field sedge, quackgrass, common timothy, spreading bentgrass, foxtail barley, and cheatgrass. A review of wildlife data from the UNHP database did not indicate the presence of any state sensitive species in the project area.

Environmental Consequences

Basis of Significance: An alternative would be considered to have a significant effect on Federally-listed threatened and endangered species if it would (1) result in the taking of a Federally-listed threatened, endangered, or proposed species or (2) have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the Utah Division of Wildlife Resource (UDWR) or USFWS.

An alternative would be considered to have a significant effect on vegetation and wildlife if it would (1) result in the substantial loss or degradation of any plant community providing high quality wildlife habitat; (2) permanently displace a substantial number of resident or migratory wildlife species; (3) have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the UDWR or USFWS; (4) Interfere substantially with movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites; (5) conflict with any applicable local policies protecting biological resources; or (6) conflict with the provisions of an adopted Habitat Conservation Plan, Natural Communities Conservation Plan, or other approved local, regional or state habitat conservation plan.

No Action Alternative

Under the No Action Alternative, there would be no construction activities and no improvements made to the existing wastewater treatment facility. Existing vegetation would remain undisturbed and there is no suitable habitat for the other non-aquatic species. As for the least chub, there are only five wild populations remaining; three located in the Snake Valley in Utah's West Desert and two in the Sevier River drainage. Therefore, there would be no impacts to biological resources.

Proposed Action Alternative

The Proposed Action would not impact any state sensitive species since according to the UNHP database, none are likely to be present in the project area. Based on field observations, presence/absence surveys, suitable habitat requirements, UNHP and USFWS data, and the scope of the project, proposed project would have **no effect** on the federally-listed Canada lynx and yellow-billed cuckoo. In regards to ULTs, presence/absence surveys discovered no ULT individuals within the project area and the UNHP has no recorded observations of ULT individuals within ½ mile of the proposed wastewater treatment facility. The survey indicated that the project area does not contain suitable ULT habitat due to a lack of sufficient hydrological conditions. Based on this information, the scope of the project, and the lack of suitable habitat, the proposed project would have **no effect** on ULTs. An effects determination report was prepared in connection with this project. See the *Logan City Wastewater Treatment Facility Threatened and Endangered Species Effects Determination Report, Cache County, Utah* in Appendix B.

There is no suitable nesting habitat for migratory birds in the project area. Migratory birds are, however, attracted to the existing lagoons for resting places. The project will retain at least some of the existing lagoons, which would continue to provide resting places for migratory birds. As a result, the project is not expected to have any adverse effect on migratory birds. Further, construction crews would be advised as to the restrictions of the Migratory Bird Treaty Act so as to not violate its provisions during construction, should any migratory birds or nests be discovered.

Mitigation

No mitigation is required.

3.5 Water Resources and Water Quality

Affected Environment

The Cutler Reservoir is located in Cache County, Utah approximately six miles west of Logan and it impounds water from the Bear River, the Logan River, the Little Bear River, and Spring Creek. Cutler Reservoir has been designated by the State of Utah as an impaired water for the identified beneficial uses of secondary contact recreation (2B); warm water game fish and their associated food chain (3B); waterfowl, shorebirds, other aquatic organisms and their associated food chains (3D); and agricultural water supply (4). Pollutant of concerns identified for Cutler Reservoir were total phosphorus with associated low DO as a consequence of nutrient loading. The State of Utah has established a threshold value of 0.025mg/L total pollutant (TP) concentration in lakes and reservoirs and 0.05mg/L in rivers as a trigger for further in-depth assessment of water-body condition and needs for the beneficial uses of recreation (2B) and warm water fishery (3B). The Cutler TMDL determined that concentrations of TP observed throughout the reservoir and tributaries were in excess of the threshold values. See Figure 6 for existing TP concentrations.

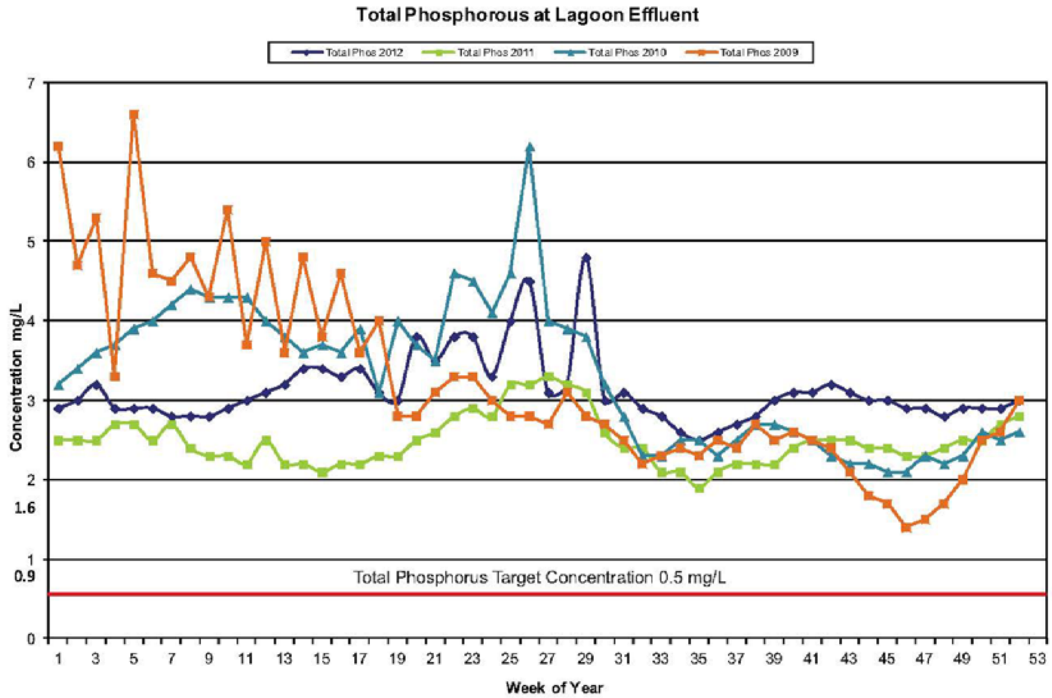

Figure 6. Total Phosphorus at Lagoon Effluent

The existing Logan Wastewater Treatment Facility is a regulated point source for phosphorus in the Cutler Reservoir watershed. Therefore, the City received notification of a new limit on total effluent phosphorus that must be met as part of the new TMDL. See Table 5 for the future phosphorus limits.

Table 5. Future Phosphorus Limits

Seasons		Limit (kg)	Limit (lb./day)
Summer	May – Oct	11,487	137.7
Winter	Nov – Apr	12,901	157.2
Year	**Seasons**	**Approx. Flow (MGD)**	**Concentration (mg/L)**
2010	Summer	15	1.1
	Winter	10	1.9
2020	Summer	17	0.9
	Winter	12	1.6
2030	Summer	20	0.83
	Winter	13	1.4
2040	Summer	24	0.69
	Winter	14	1.3

Source: Wastewater Treatment Master Plan Update 2013

Notes: These limits were based in part of maximum day flows not considering recommended wet weather equalization.

The future phosphorus limit is mass based, so as flows increase, the effluent concentration required to meet the limit will decrease. Based on the maximum projected flow in 2040, the 2013 Updated Plan estimated the required effluent concentration to be about 0.69 mg/L total phosphorus. To be able to reliability meet the phosphorus limit, the new facility needs to be capable of reliably achieving total phosphorus concentrations of 0.5mg/L. Also, the new regulations on ammonia require the inclusion of a chronic ammonia limit in the new permit for the facility, which currently only includes an acute ammonia limit, as well as lower acute ammonia limits.

Environmental Consequences

Basis of Significance: An alternative would be considered to have a significant effect on water resources if it would (1) violate any water quality standards or waste discharge requirements; (2) substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (i.e., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted); (3) substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site; (4) substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site; or (5) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional polluted runoff sources.

No Action Alternative

Under the No Action Alternative, no improvements would be made to meet the new EPA water quality standards and therefore, existing water quality conditions and trends would continue unabated. See Table 6 for existing limits and mass loadings. Further, Cutler Reservoir would continue to be impaired and fail to meet its beneficial uses.

Table 6. Existing Limits and Mass Loadings for Ammonia and Phosphorus

Existing Limits	Season			
	Summer	Fall	Winter	Spring
Permitted Flow (mgd)	22.0	21.0	16.0	21.0
Ammonia Daily Max (mg/L)	9.1	11.2	14.4	11.9
Ammonia Loading (lb./day)	1,670	1,960	1,920	2,080
Ammonia – 30 Day Average (mg/L)	No Limit	No Limit	No Limit	No Limit
BOD – 30 Day Average (mg/L)	25	25	25	25
BOD – 30 Day Mass Loading (lb./day)	4,590	4,380	3,340	4,380
TSS – 30 Day Average (mg/L)	25	25	25	25
TSS – 30 Day Mass Loading (lb./day)	4,590	4,380	3,340	4,380
Total Phosphorus Mass Loading	No Limit	No Limit	No Limit	No Limit

Source: Wastewater Treatment Master Plan Update 2013

The No Action Alternative would result in the failure of the Logan City Wastewater Treatment Facility to meet the new ammonia and phosphorus limits since the existing facility is not able to reduce the effluent phosphorus and ammonia levels to the limits required by the EPA. Under this scenario, Logan City may incur penalties and fines for failure to comply with the EPA limits, amounting to $30,000 to $50,000 per day. Further, DWQ and/or other stakeholders with interests in the water quality of Cutler Reservoir may seek redress for the continuing impairment by administrative or judicial means.

Proposed Action Alternative

Under the Proposed Action Alternative, a new treatment facility would be constructed which would be able to meet the new EPA standards for phosphorus and ammonia effluent discharge. See Table 7 for the proposed limits and mass loadings, as detailed more fully in the 2013 Updated Plan (which includes the DWQ Anti-Degradation review). The Proposed Action Alternative would also involve an increase in impervious surfaces due to the construction of the new buildings, roads and other facilities. This would involve minor increases in surface water runoff.

Table 7. Proposed Limits and Mass Loadings for Ammonia and Phosphorus

Proposed Limits	Season			
	Summer	Fall	Winter	Spring
Projected Flow (mgd)	24	18	15	18
Daily Max Ammonia Limit (mg/L)	6.0	7.0	5.0	8.0
Daily Max Ammonia Loading (lb./day)	1,200	1,050	626	1,070
Ammonia – 30 Day Average (mg/L)	1.3	2.3	3.0	3.0
Ammonia – 30 Day Mass Loading (lb./day)	260	390	375	400
Expected BOD – 30 Day Average (mg/L)	<10	<10	<10	<10
BOD – 30 Day Mass Loading (lb./day)	2,000	1,500	1,250	1,330
Expected TSS – 30 Day Average (mg/L)	<10	<10	<10	<10
TSS – 30 Day Mass Loading (lb./day)	2,000	1,500	1,250	1,330
Total Phosphorus Mass Loading	138	--	157	--

Source: Wastewater Treatment Master Plan Update 2013

Under the Proposed Action Alternative, the water quality in the Cutler Reservoir would be improved, with the overall levels also being dependent upon other source points also being in compliance with the TMDL standard.

Mitigation

Section 402 of the Clean Water Act regulates discharges of pollutants to surface waters. Construction projects that disturb more than one (1) acre of land must be covered under the statewide Utah Pollutant Discharge Elimination System (UPDES) Storm Water General Permit for Construction Activities. To obtain a UPDES permit, a Storm Water Pollution Prevention Plan (SWPPP) will be developed and incorporated into the final design plans of the project and a Notice of Intent (NOI) form will be submitted to DWQ prior to construction of the project. Further, best management practices (BMPs) will be implemented during construction to prevent impacts to water quality.

As mitigation for the increase in surface water runoff, the project would comply with city and county stormwater requirements.

3.6 Wetlands and Waters of the U.S.

Affected Environment

Ryan Pitts and Nicole Tolley of Horrocks Engineers conducted a field reconnaissance on July 18, 2013. The delineation study area of 62.9 acres was investigated to identify all wetlands and Waters of the U.S. present. Potentially jurisdictional wetlands and Waters of the U.S. were identified, documented, and mapped. Approximately 14.92 acres of palustrine wetland (mash and wet meadow) were identified and delineated within the study area and approximately 1.74 acres (5,185 linear feet) of Waters of the U.S. were also documented. See Table 8 – Wetlands Identified in the Project Area, Table 9 – Waters of the U.S. Identified in the Project Area, and Figure 7 – Wetlands and Waters of the U.S., as well as the *Logan Wastewater Treatment Facility Wetland Delineation and Waters of the U.S. Report* in Appendix C. After the delineation was completed, an additional area located between the north fence and the base of the existing sewer lagoons (totaling approximately 7 acres) was added to the total wetland area. This area was not delineated but was assumed to constitute wetlands.

Table 8: Wetlands Identified in the Project Area

Wetland ID	Size (acres)	Hydrogeomorphic Classification*
Wetland 1	0.03	PEMA
Wetland 2	4.62	PEMA
Wetland 3	3.25	PEMA
Wetland 4	0.35	PEMA
Wetland 5	0.32	PEME
Wetland 6	1.81	PEMA
Wetland 7	0.26	PEMA
Wetland 8	0.70	PEMA
Wetland 9	1.50	PEMA
Wetland 10	0.77	PEMA
Wetland 11	0.59	PEMA
Wetland 12	0.43	PEMA
Wetland 13	0.29	PEME
Total	**14.92**	

**PEMA= palustrine emergent temporarily flooded; PEME=palustrine emergent seasonally flooded*

Five unnamed canals/ditches were identified and in use in the delineation study area at the time of the field visit. Waters of the U.S. 1 is the largest canal/ditch documented. It flows from the east to the west and bisects the study area. It appears to originate east of the study area in a natural slough and flows to the Little Bear River. The other canals/ditches documented distribute water from Waters of the U.S.

Table 9: Waters of the U.S. Identified in the Project Area

Water ID	Size (acres)	Linear Feet
Waters of the U.S. 1	1.08	2,720
Waters of the U.S. 2	0.26	1,120
Waters of the U.S. 3	0.009	180
Waters of the U.S. 4	0.05	525
Waters of the U.S. 5	0.34	640
Total	**1.74**	**5,185**

Environmental Consequences

Basis of Significance: An alternative would be considered to have a significant impact on wetlands if it has a substantial adverse effect on federal protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to marshes, vernal pools, coastal areas, etc.) through direct removal, filling, hydrological interruption or other means.

No Action Alternative

The No Action Alternative would not involve construction activities or improvements to the project area. There would therefore be no impacts to wetlands or Waters of the U.S. as a result of the No Action Alternative.

Proposed Action Alternative

Under the Proposed Action, there would be impacts to wetlands due to the construction of the new facilities. The facility has a footprint of approximately 30 acres and, although the facility is planned to be located on the driest areas of the site, there will impacts to as much as 8.14 acres of wet meadow vegetation and existing water ways. The project will also impact approximately 0.414 acres of waters of the U.S. See Figure 7 – Potential Impacts to Wetlands and Waters of the U.S. The project will reroute the irrigation canal from its existing alignment to the south of the proposed facility and will be incorporated into the planned landscaping treatments intended to mitigate for visual impacts. The new pipeline alignment has not been surveyed for potential wetland impacts. Wetlands may be present along the proposed alignment due to its location at the base of the berms containing the lagoons; however, the construction of the new pipeline would have only temporary impacts during construction to any wetlands that may be present, with all disturbed areas being rehabilitated and revegetated after construction. If wetland impacts are identified, coordination with the USACE will occur.

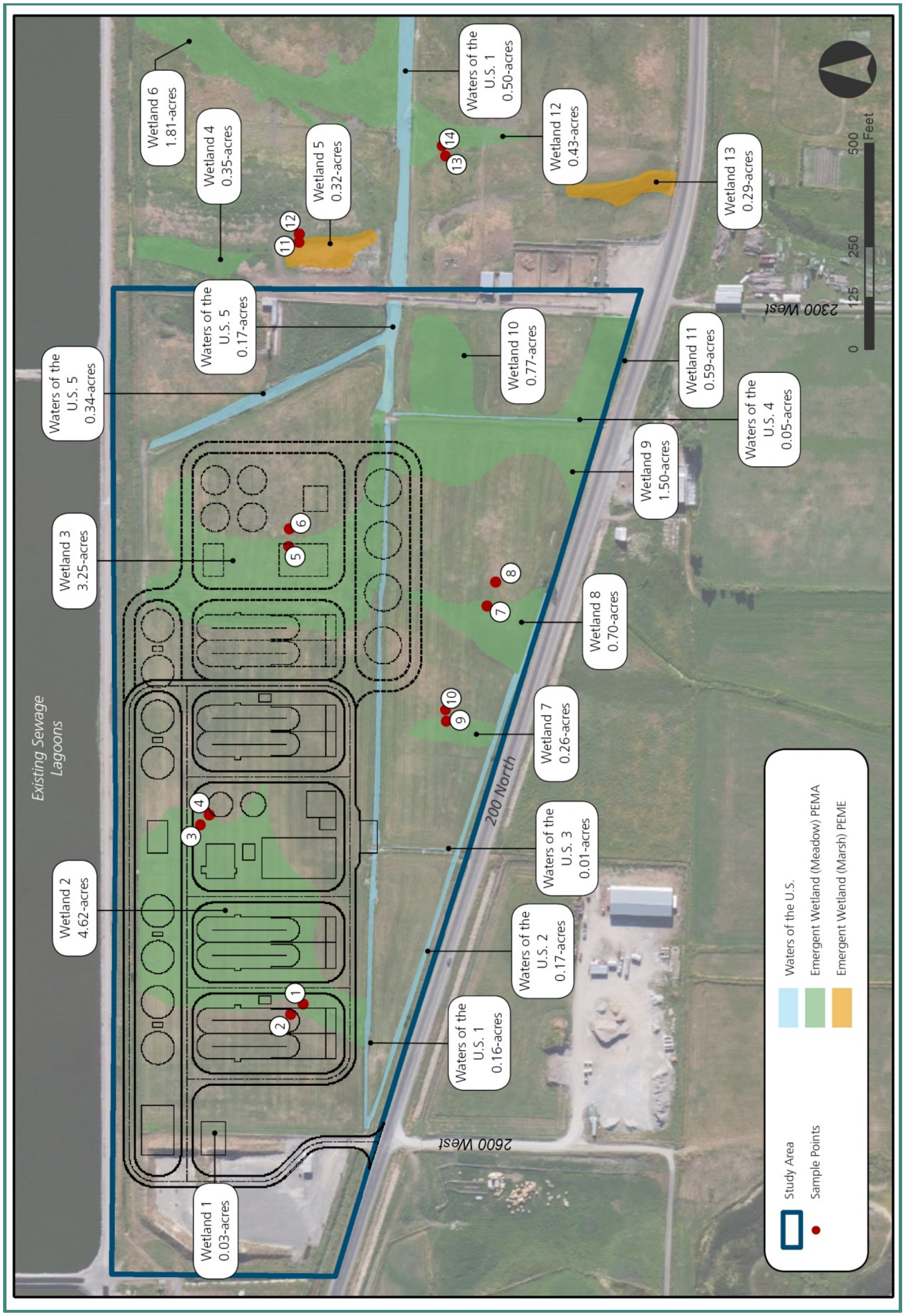

Figure 7. Delineated Wetlands and Waters of the U.S.

Mitigation

The project will require a 404 permit from the United States Army Corps of Engineers (USACE) for impacts to wetlands and Waters of the U.S., as well as mitigation for said impacts. A 401 Water Quality Certification from the Utah Division of Water Quality (UDWQ) will also be obtained in connection with the 404 permit.

To compensate for anticipated impacts to wetlands and Waters of the U.S., the City proposes to construct new wetlands adjacent to former wetland mitigation sites. Logan City maintains a constructed wetland site that was used as a wetland bank for commercial and City projects requiring mitigation. These are deed-restricted wetlands that have proven successful. The most recent project was a 10-acre wetland constructed in 2010 (YESCO project). However, it is anticipated that an additional mitigation site will be created this summer (2014). The site is located south of the existing treatment lagoons and Highway 30 (200 North), and west of the existing landfill. Within the property owned by Logan City in this area, there are approximately 25 acres available between the existing constructed wetlands and landfill leachate ponds that are a potential mitigation site (see Figure 8 – Proposed Wetland Mitigation Site). The site is currently dry and has been used as a soil borrow pit for landfill daily cover. Environmental benefits of a project in this area include additional wildlife and vegetative habitat adjacent to established wetlands and improved water quality of surface runoff that would pass through the wetlands from upland areas north of the site prior to entering the Logan River.

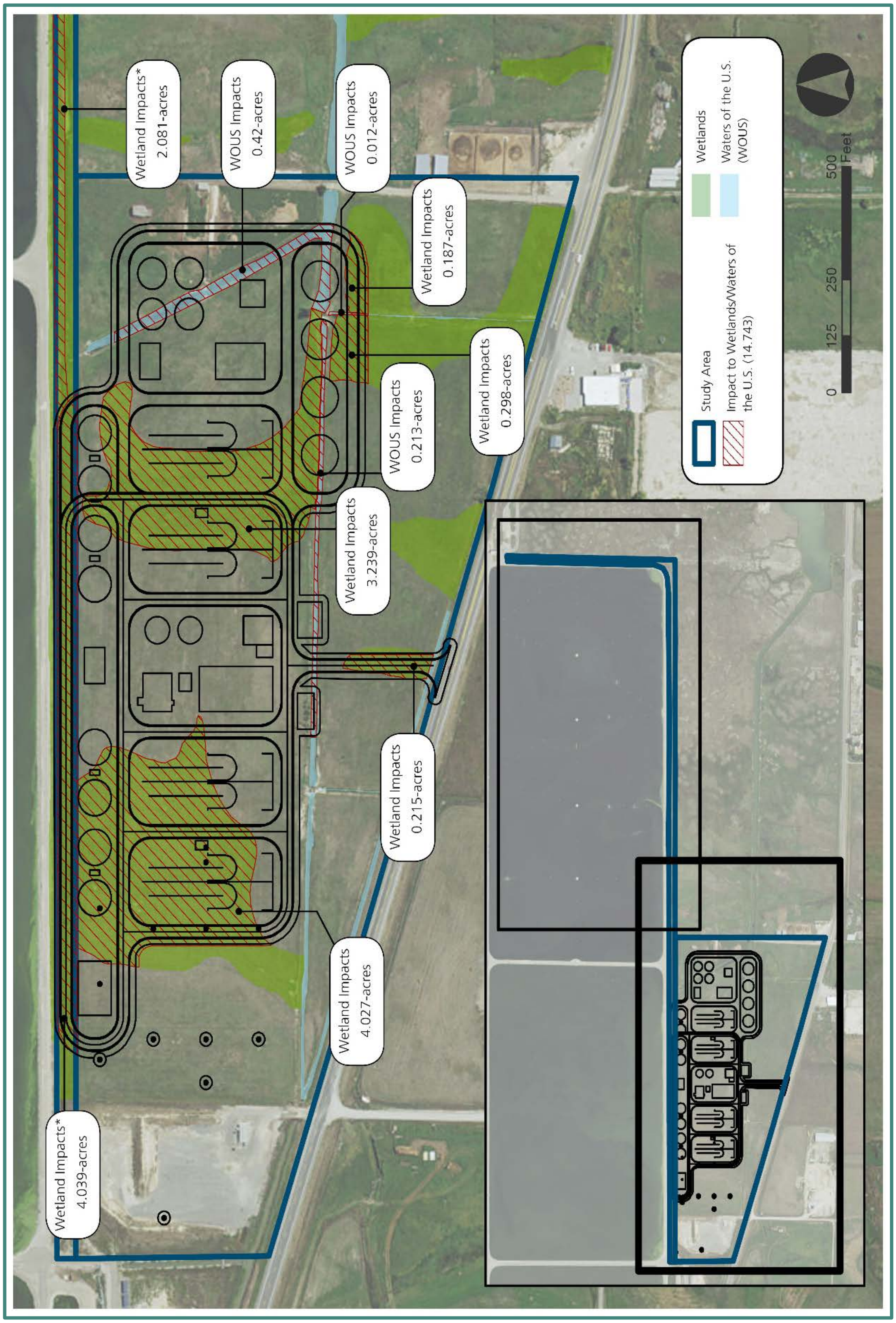

Figure 8a. Potential Impacts to Wetlands and Waters of the U.S.

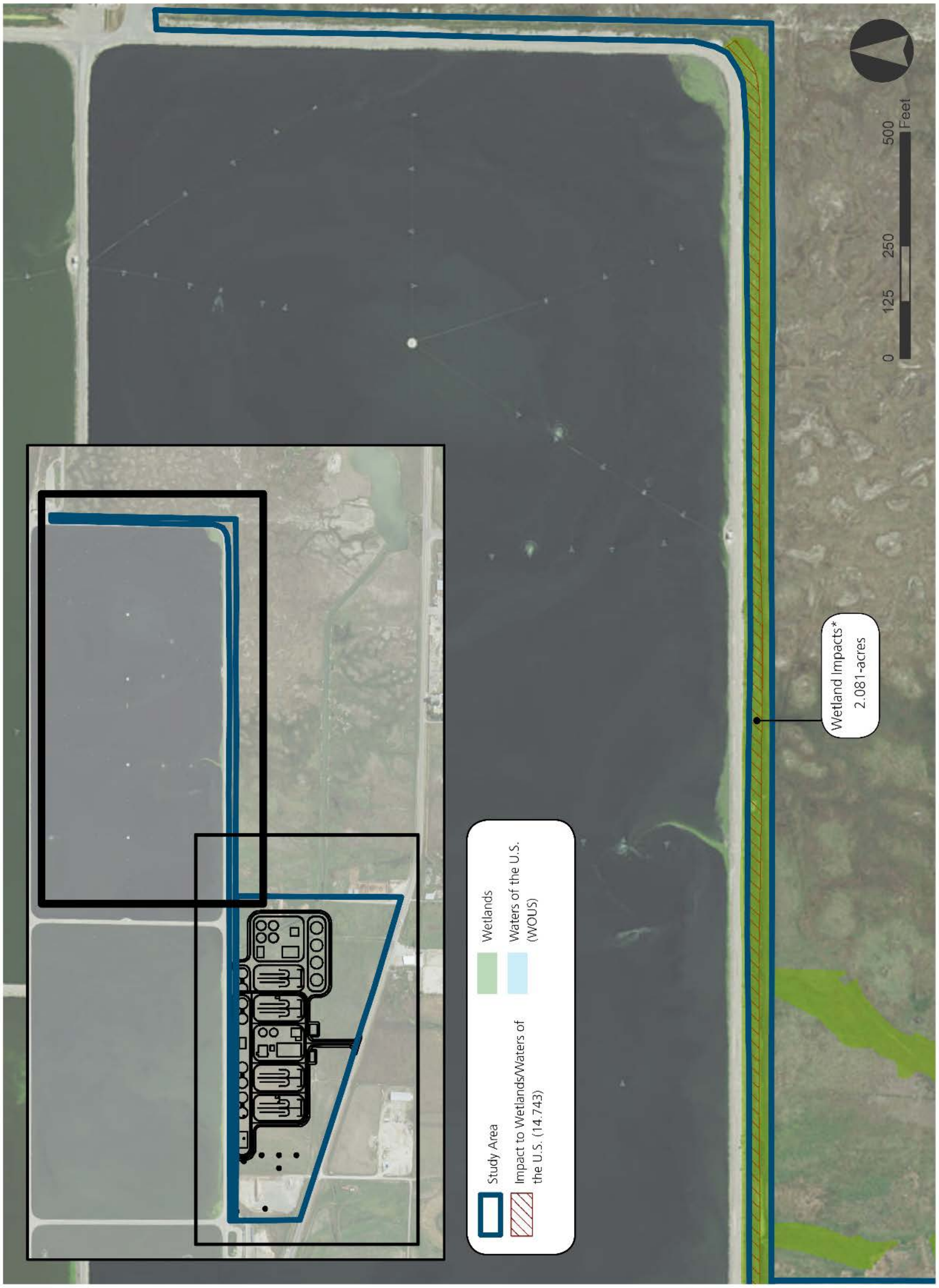

Figure 8b. Potential Impacts to Wetlands and Waters of the U.S.

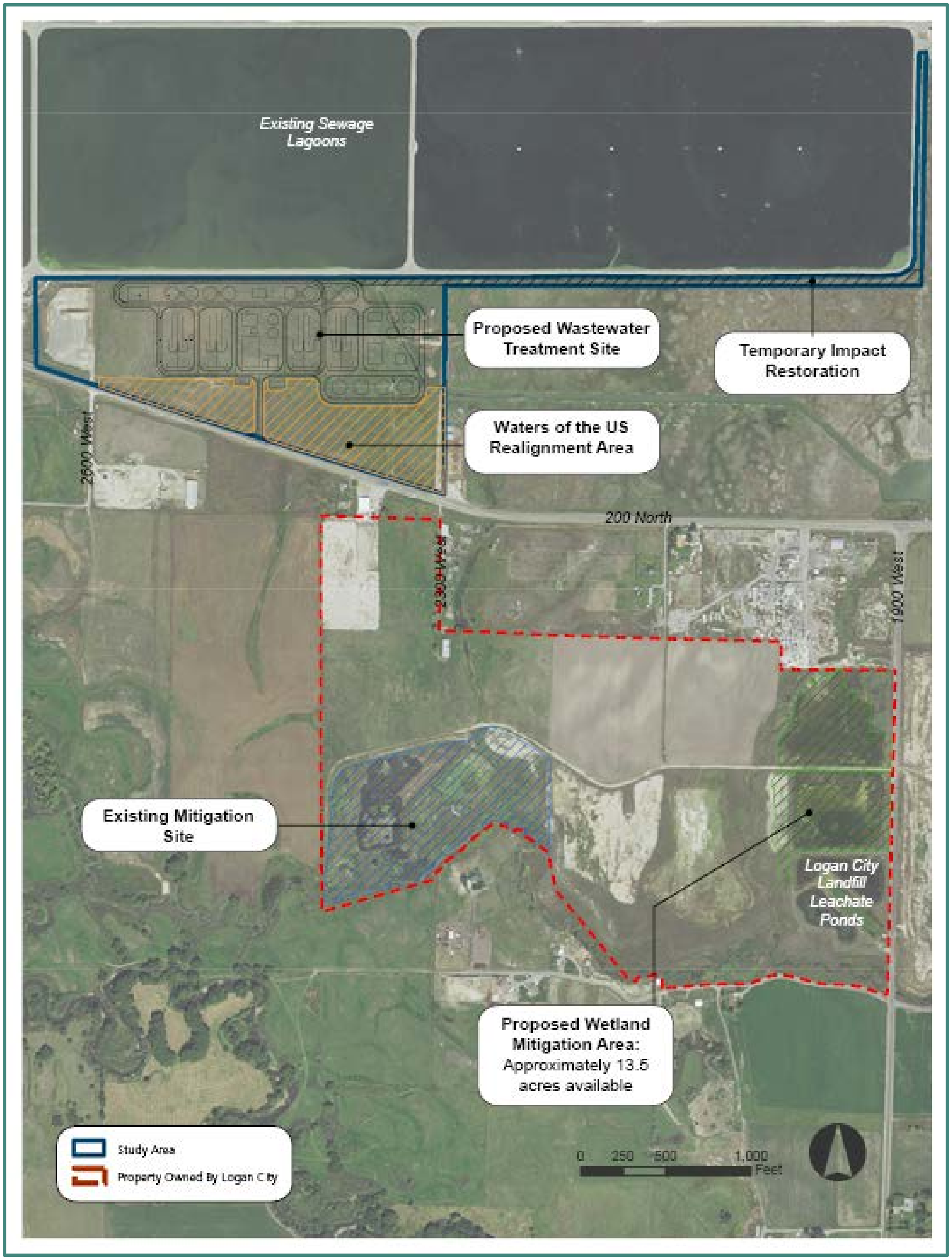

Figure 9. Proposed Wetland Mitigation Site

3.7 Floodplains

Affected Environment

According to the Flood Insurance Rate Map (FIRM) maintained by the Federal Emergency Management Agency (FEMA), there are no floodplains in the project area. There is a flood zone in connection with the Logan River located south of the project area, as well as in connection Cow Pasture Canal located east of the project area that feeds into the Logan River. The floodplain for the Logan River and the Cow Pasture Canal is designated as Zone A – No Base Flood Determined. See Figure 9 – Floodplains in the Project Area.

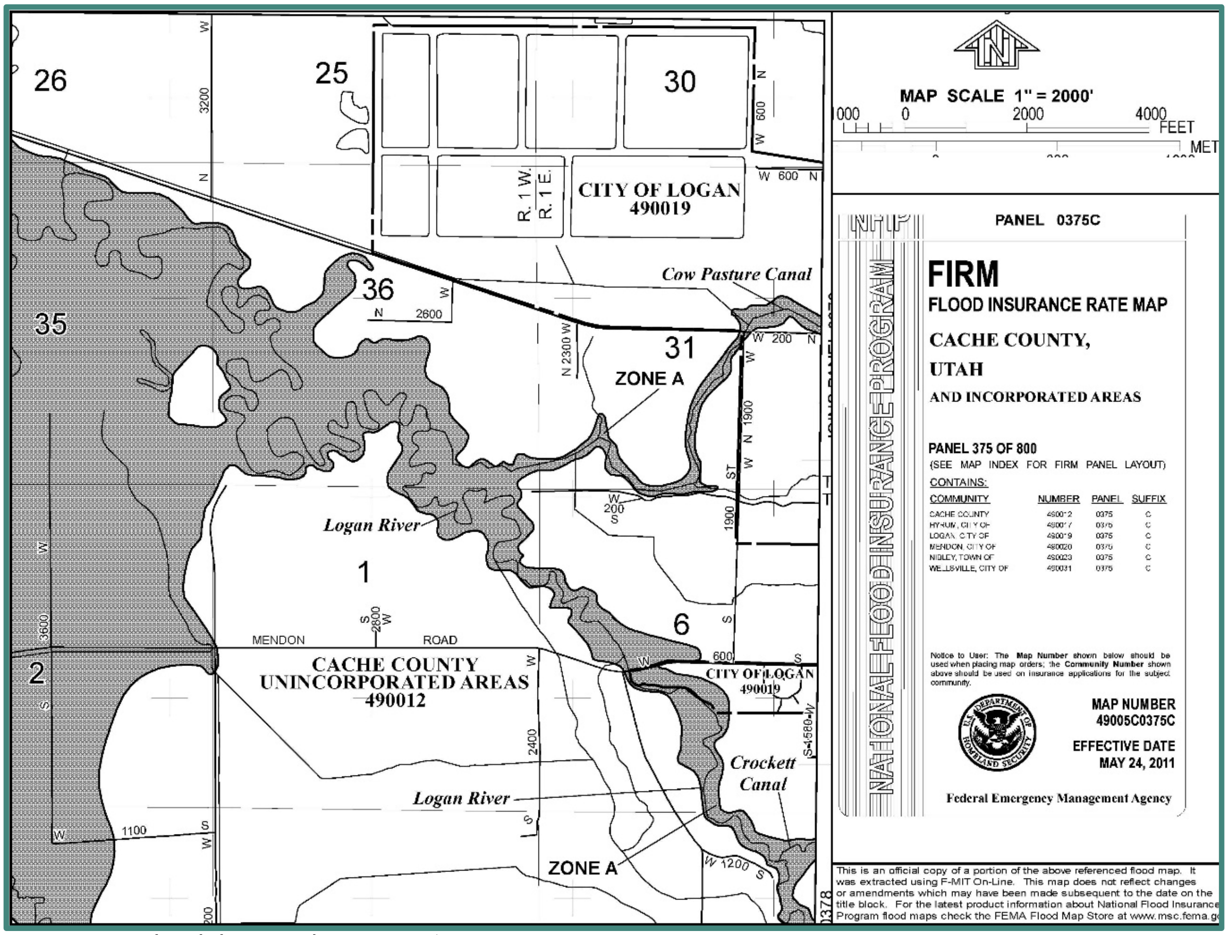

Figure 10. Floodplains in the Project Area

Environmental Consequences

Basis of Significance: An alternative would be considered to have a significant impact on floodplains if it (1) placed housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map; (2) placed structures within a 100-year flood hazard area that would impede or redirect flood flows; or (3) exposed people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam or as the result of inundation by seiche, tsunami, or mudflow.

No Action Alternative

The No Action Alternative would not involve construction activities within designated floodplains and therefore would not have any impacts upon floodplains. Further, the No Action Alternative would not expose people or structures to a significant risk of flooding or inundation by other means. The existing lagoons would either be maintained so as to prevent the risk of failure or would be decommissioned.

Proposed Action Alternative

Under the Proposed Action, there would be no introduction of structures into a 100-year floodplain. The Project Area is outside of the designated floodplain and would not alter or impair the functionality of the existing floodplains in areas adjacent to the project area.

Mitigation

No mitigation is required.

3.8 Socio-Economic/Environmental Justice

Affected Environment

As noted above, the current wastewater treatment facility serves the cities of Logan, North Logan, Smithfield, Hyde Park, River Heights, Providence, and Nibley, as well as the Utah State University (located in Logan). Population for those cities is shown in Table 10.

Table 10. Population Projections for Cities in Logan City Wastewater Treatment Service Area

City	2000	2010	2020	2030	2040
Hyde Park	2,955	3,546	4,255	4,393	5,382
Logan	42,670	50,770	6,0800	67,660	72,280
Nibley	2,045	2,454	2,945	3,387	3,726
North Logan	6,163	7,396	8,875	10,206	11,227
Providence	4,377	5,252	6,302	7,247	7,972
River Heights	1,496	1,795	2,154	2,477	2,725
Smithfield	7,523	9,028	10,384	12,459	13,705
Millville	1,507	1,808	2,170	2,496	2,745
Totals	**68,736**	**82,049**	**98,335**	**110,825**	**119,762**

Source: U.S. Census, Governor's Office of Planning & Budget, Cache Metropolitan Planning Organization (as quoted in Logan City Wastewater Treatment Master Plan 2013)

In 2006, Carollo Engineers analyzed Logan City's wastewater treatment lagoons and documented their findings and recommendations in a Facility Plan. Based on population projections for Cache County, the

2013 Updated Facility Plan identified the existing lagoon system to have hydraulic capacity to function through 2040.

Environmental Consequences

Basis of Significance: An alternative would be considered to have a significant impact on social conditions if it would (1) displace substantial numbers of existing housing and/or substantially alter the socioeconomic character of neighborhoods ; (2) unduly disrupt or divide cohesive communities; (3) displace business(es) that are unusually important because its products or services are uniquely dependent on its location, serves a population uniquely dependent on its services in its present location, or is the subject of publicly adopted plans aimed at its preservation; or 4) result in substantial new development that is markedly different from existing uses, development, and activities within the neighborhood. An alternative would be considered to have a significant impact on environmental justice populations if it would have an adversely high and disproportionate impact on minority or low-income populations.

No Action Alternative

The No Action Alternative would have an adverse impact upon social conditions in the project area in that the water quality in Cutler Reservoir would not be addressed as far as the contributions from the existing Logan City facilities are concerned. Further, failure to comply with the EPA's requirements for phosphorus and ammonia discharges would result in significant fines and penalties that would accumulate on a daily basis.

The No Action Alternative would not have an adversely high and disproportionate impact on minority or low-income populations since there would be no changes to the existing wastewater treatment facilities or the existing fee schedule. Further, the continuing impacts to the water quality of Cutler Reservoir would impact all users of the reservoir equally.

Proposed Action Alternative

Under the Proposed Action, there would be a monthly treatment fee increase of between $9.47 to $10.80 that would vary based upon the financing arrangement for the project, including the amount of the loan, the interest rate, and the availability of grant money from the DWQ.

The fee increases would be the same for all users, regardless of race, gender, income, or minority status and therefore would not have an adversely high and disproportionate impact on minority or low-income populations.

Mitigation

No mitigation is required.

3.9 Air Quality

Affected Environment

The Clean Air Act Amendments of 1990 requires that the EPA set standards for pollutants that are considered harmful to public health and the environment. These criteria pollutants are identified as carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), lead (Pb), particulate matter smaller than 10 microns (PM_{10}), particulate matter smaller than 2.5 microns ($PM_{2.5}$), and sulfur dioxide (SO_2). The project area is in an area classified as non-attainment for $PM_{2.5}$, but is listed as in attainment for all other criteria pollutants. In the project area, the primary source of hydrocarbon emissions and fugitive dust in and near the project area is SR-30, which runs adjacent to the project area on the south. Also, due to the nature of the facility as a wastewater treatment plant, unpleasant odors can and do occur in the project area as a result of regular operations.

Sensitive receptors for air quality analysis purposes include sensitive land uses and those individuals and/or wildlife that could be affected by changes in air quality due to emissions and fugitive dust from the project. Air quality sensitive land uses in the project area include commercial and administrative properties located within 1.5 miles east of the project area and residential areas, including public schools, located approximately 2 miles east and within 2 miles to the south of the project area. Cutler Reservoir is located approximately 4 miles northwest of the project area), which includes recreational uses.

Environmental Consequences

Basis of Significance: An alternative would be considered to have a significant effect on air quality if it would (1) violate any ambient air quality standard, (2) contribute substantially on a long-term basis to an existing or projected air quality violation, (3) conflict with or obstruct implementation of an applicable air quality plan, (4) expose humans or sensitive species to substantial pollutant concentrations, (5) not conform to applicable local standards, (6) result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors), or (7) create objectionable odors affecting a substantial number of people.

No Action Alternative

Under the No Action Alternative, existing conditions would continue to occur, both in regards to air quality and the potential for unpleasant odors. The current facility would not cause violations of or contribute substantially on a long term basis to a violation of any ambient air quality standard. Due to the isolated nature of the facility, there would be a low potential for objectionable odors to affect a substantial number of people, absent future potentially sensitive development around the facility. There would be no construction activities; therefore, there would be no impacts to air quality as a result of construction activities (i.e., fugitive dust, emissions from construction equipment, etc.).

Proposed Action Alternative

The project area is in a non-attainment area for $PM_{2.5}$. The Proposed Action would not cause violations of or contribute substantially on a long term basis to a violation of any ambient air quality standard. It would not expose humans or sensitive species to substantial pollutant concentrations or result in a cumulatively considerable net increase of $PM_{2.5}$. It would also be in compliance with all applicable air quality plans and local air quality standards.

The Proposed Action Alternative would construct new facilities for the wastewater treatment facility which would enclose the wastewater treatment operations within structures, thus helping to reduce unpleasant odors escaping from the facility. Further, the facility would include an odor control and recovery system, which would help reduce the potential for unpleasant odors to affect surrounding properties and for travelers on SR-30. Due to the isolated nature of the facility, there would be a low potential for objectionable odors to affect a substantial number of people, absent future potentially sensitive development around the facility.

The Proposed Action Alternative would involve construction activities and therefore would have temporary impacts to air quality during construction.

Mitigation

A permit for air quality impacts during construction will be obtained from the Utah Division of Air Quality (UDAQ) by the contractor. Fugitive dust during construction will be mitigated and controlled in accordance with a dust-control plan to be developed with UDAQ. This plan will include measures to minimize fugitive dust, such as the application of dust suppressants and water sprays, minimizing the extent of disrupted surface areas, and restricting activities during high-wind periods. BMPs will be utilized during construction to minimize air quality impacts.

3.10 Noise

Affected Environment

Noise can be defined as unwanted sound and noise levels and its effects are interpreted in relationship to its effects on sensitive receptors. Noise-sensitive receptors include sensitive land uses and those individuals and/or wildlife that could be affected by changes in noise sources or levels due to the project. Due to the somewhat isolated nature of the project area, there are no noise-sensitive land uses in the project area. The nearest residential structure to the project area is approximately 1 mile to the south. The primary sources of ambient noise in the project area are traffic from the nearby SR-30 and the mechanical operations of the facility itself.

Environmental Consequences

Basis of Significance: An alternative would be considered to have a significant effect on noise if it would (1) substantially increase ambient noise levels over the long term or (2) constitute a nuisance as defined by a local code or ordinance. The significance of noise effects is evaluated with reference to the distance from the noise source and the number of sensitive receptors affected.

No Action Alternative

Under the No Action Alternative, the wastewater treatment facility will continue to operate as currently. The current wastewater treatment process is a passive system utilizing lagoons; however, it does include mechanical aerators that do produce a low level of ambient noise when in operation. Under this alternative, the ambient noise levels in the project area would not differ from existing conditions.

The No Action Alternative would not involve any construction activities and therefore would not have any temporary construction noise impacts.

Proposed Action Alternative

Under the Proposed Action Alternative, ambient noise levels in the project area would not be substantially different that currently exist. While the Proposed Action would introduce new noise sources in the form of mechanized equipment, the noise from said equipment would be minimized by their inclusion mostly within structures. Further, due to the isolated nature of the project site, there are no noise sensitive receptors in the project area.

Mitigation

No mitigation is required.

3.11 Visual and Aesthetics

Affected Environment

The project area consists of mostly vacant land that has historically been utilized for agricultural production (hay growing and livestock grazing). It is adjacent to SR-30, which is a two-lane roadway in this area. The existing lagoons are located adjacent to the project area on the north.

Environmental Consequences

Basis of Significance: An alternative would be considered to have a significant effect on aesthetics if long-term changes in landform vegetation, or structural features substantially affect the sensory conditions (i.e. viewshed) as compared to surrounding conditions. Such conditions include whether it will (1) have a substantial adverse effect on a scenic vista; (2) substantially damage scenic resources, including, but not limited to trees, rock outcroppings, or historic buildings; (3) significantly degrade the existing visual character or quality of the site and its surroundings; or (4) create a new source of substantial light or glare which would adversely affect day or nighttime views in the area. The significance of aesthetics is evaluated with reference to the number of receptors affected.

No Action Alternative
Under the No Action Alternative, existing conditions and trends would continue as at present. The land is currently zoned as a Gateway designation and no changes to that designation are included in the future land use plans so any development of the area would be consistent with said designation. The No Action Alternative would not involve construction activities in relation to the wastewater treatment plant and therefore would have no impact on the existing viewshed in the project area.

Proposed Action Alternative
The Proposed Action would introduce new elements into the viewshed. Currently, there are no structures in the project area, with the existing lagoons hidden behind a large berm, which ranges in height from 5 feet to 20 feet dependent upon the slope of the land. New structures would be built as part of the new wastewater treatment facility. The new facilities would include several buildings, as well as pump stations and above-ground tanks, access roads and parking facilities, and other features. The clarifiers will be approximately 75 foot diameter concrete tanks approximately 18 feet tall. The Bioreactors will be approximately 300 feet long, 75 feet wide, and approximately 18 feet tall, also made of concrete.

Landscaping treatments are planned to be implemented along the south side of the project area near the roadway to help mitigate for the visual impact of the new structures and to present a more pleasant and inviting viewshed for travelers along the roadway. Further, there are other commercial-type structures on surrounding properties to the west and the proposed new structures are not incompatible with the surrounding properties.

Mitigation
Landscaping treatments are planned to be implemented along the south side of the project area near the roadway to help mitigate for the visual impact of the new structures and to present a more pleasant and inviting viewshed for travelers along the roadway.

3.12 Hazardous, Toxic and Radiological Waste

Affected Environment
A Phase I Environmental Site Assessment (Phase I ESA) was prepared in connection with this project by Intermountain GeoEnvironmental Services, Inc. See the *Phase I ESA Proposed Waste Water Treatment Facility, 2300 West Highway 30, Logan, Utah* in Appendix D. The Phase I ESA included a regulatory database search for the project area, as well as field reconnaissance and historical use investigations.

According to the regulatory database search, no hazardous waste sites were identified in either the federal, state, or tribal databases. The site is mostly vacant and has been historically used for agricultural production and livestock grazing. The site is surrounded by other properties with similar uses, including rifle ranges, waste water treatment and an auto salvage yard. The Logan City Landfill is located approximately ¼ mile southeast. Based upon the proximity of the landfill and the shallow groundwater in the area, additional research was done regarding potential groundwater contamination. Findings indicate the volatile organic compounds are present in the groundwater, but have not been observed at levels that exceeds the solid waste ground water protection standard. Further, the Logan City Landfill has been participating in a voluntary corrective action program since at least 2009, intended to collect leachate that has migrated offsite through the groundwater.

The federal EPA radon zone for the site is 2 (meaning that indoor areas have a moderate potential for elevated radon levels, with a predicted average indoor radon screening level of between 2 and 4 pCi/L (Picocuires/Liter).

The Phase I ESA concluded that there were no obvious recognized environmental conditions on the site and no existing environmental conditions on adjacent properties that pose an immediate threat to the site.

Environmental Consequences

Basis of Significance: An alternative would be considered to have a significant effect on hazardous, toxic or radiological waste if it would result in the disturbance of hazardous, toxic or radiological waste requiring substantial remediation efforts in order to not jeopardize public health and safety.

No Action Alternative

The No Action Alternative would not involve construction activities and therefore there would be no potential to encounter hazardous materials during construction. Ongoing maintenance activities at the existing facility would continue to occur at the site, which may involve the potential for the introduction of hazardous materials in the event of accidental spills, etc.

Proposed Action Alternative

Under the Proposed Action Alternative, there is a low likelihood of encountering hazardous materials during construction due to the lack of identified hazardous material sites in the project area. It is recommended that soil be screened for radon due to the potential for moderate to elevated radon levels in the area. Due to the nature of the facility, indoor usage during operation of the facility would be limited, thereby limiting potential exposure to radon. Further, the use of imported backfill and the closure and capping of the nearby landfill will reduce the potential for radon.

Mitigation

If hazardous waste material is encountered during construction, the contractor will immediately cease all construction activity in the area and notify the project engineer. Should radon be determined to be an issue during soil testing, vapor barriers will be provided for the buildings' interior areas.

3.13 Geology and Soils

Affected Environment

A geotechnical report was prepared in connection with this project, analyzing the existing soil conditions in the project area and the suitability to support the construction of the proposed project. See the *Geotechnical Investigation, Logan Wastewater Treatment Plant Improvement Project, 2600 West 200 North, Logan, Utah* in Appendix E.

Based on observations and geologic literature review, the site is underlain by Late Quarternary-aged lacustrine silt and clay deposited by Lake Bonneville. It is estimated that the upper 30 feet of the soil in the explorations consists of fine- grained silts and clays. Low blow counts, high measured moisture contents and dry densities within this soil also indicate that soft clay is highly compressible. Below 30 feet, the soil profile begins to include some sandy layers from 1 to 11 feet thick.

Groundwater was observed in most of the subsurface investigations. Based upon pore pressure dissipation tests, artisan water pressure would be expected at depths greater than 65 feet below the ground surface; however, at depths of approximately 30 feet below the ground surface, the groundwater level would be approximately 5 feet. Measurements taken by Logan City personnel have indicated that groundwater is approximately 4.5 to 5 feet below grade. The groundwater level can fluctuate several feet based upon factors such as snowmelt, spring runoff, irrigation on surrounding properties, high precipitation events, etc. It may also be influenced by the existing Logan Sewer Treatment Ponds.

There are no known active faults that pass under or immediately adjacent to the site. Based upon boring explorations and measurements of shear wave velocities, the location is best described as a Site Class E (soft soil profile). The site is also located within an area designated on the *Liquefaction Potential Map for Cache Valley, Cache County, Utah* map published by the Utah Geological Survey as having a "low" liquefaction potential; however, the Geotechnical Report classifies this site as having "moderate" liquefaction potential.

Environmental Consequences

Basis of Significance: An alternative would be considered to have a significant effect if the proposed project exposes people or structures to geologic hazards or produces unstable geological conditions. Adverse impacts can result from strong seismic shaking, landslides, mudslides, and ground failure, including liquefaction, landslides, lateral spreading, and subsidence.

No Action Alternative
Under the No Action Alternative, there would be no construction activities on the site. Therefore, there would be no impact to geological or soil conditions in the project area.

Proposed Action Alternative
The Proposed Action Alternative would not expose people or structures to geologic hazards or produce unstable geologic conditions in the project area. The project area does not sit on a fault line and the potential for seismic activity in the area would be factored into the design of the facilities. The Geotechnical Report indicated that the site was suitable for the proposed development, provided that the recommendations contained in the report are incorporated into the design and construction of the project.

Mitigation
No mitigation is required.

3.14 Cumulative Effects

The Council on Environmental Quality (CEQ) regulations, which implement the National Environmental Policy Act of 1969 (42 USC 4321 et seq.), require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for both action and no action alternatives.

Cumulative impacts were determined by combining the impacts of the given alternative with other past, present, and reasonably foreseeable future actions. Therefore it was necessary to identify other past, ongoing, or reasonably foreseeable future action in the vicinity of the project area. For the purposes of this analysis, the geographic scope is defined in relation to the individual resources included in the cumulative impacts analysis. The temporal scope of the analysis is limited to a 20-year time frame as the reasonably foreseeable future, based upon an estimated life cycle of the proposed facilities.

The cumulative impact analysis focuses on environmental resources which would have direct or indirect impacts. The Proposed Action would have no effect or a minimal effect on many environmental resources; therefore, there would be no cumulative effect to these resources, which include:

- Land Use
- Air Quality
- Hazardous Materials
- Noise
- Cultural Resources
- Biological Resources
- Geology and Soils

Water Quality

The geographic scope for water resources consists of the Bear River Basin watershed, which covers northeastern Utah, southeastern Idaho, and southwestern Wyoming. The Bear River ranges in elevation from over 13, 000 to 4,211 feet and is unique in that it is entirely enclosed by mountains, thus forming a huge basin with no external drainage outlets. The Bear River is the largest tributary to the Great Salt Lake and is the largest stream in the western hemisphere that does not empty into the ocean.

Currently, 52 streams and 9 lakes in the basin are listed on 303(d) lists of impaired waters in the three states covered by the basin. Water quality problems include sediment, nutrients, fecal coliform bacteria, low dissolved oxygen and high water temperature. Pollutant sources include animal feeding operations, grazing, agriculture, wastewater treatment, degraded stream banks, urban development, roads, phosphate mining, oil and gas explorations, and logging. Eleven TMDLs have been completed, with an additional 42 presently in development.

The Middle Bear-Logan Watershed does not include any of the mainstream of the Bear River. It is comprised entirely of the drainage areas of several major tributaries of the Bear River, which flow form the east and south into the shallow southern arm of Cutler Reservoir. Logan's wastewater treatment lagoons, which discharge into Swift Slough (a smaller tributary to Cutler Reservoir in this watershed) contribute over 20% of the total dissolved phosphorus entering the reservoir.

The EPA regulations regarding phosphorus and ammonia effluent limits are not limited in is application to the Logan Waste Water Treatment Facilities alone. The combined efforts of all identified point sources would result in less phosphorus and ammonia being discharged into the Cutler Reservoir and thereby, improved water quality.

Wetlands

The geographic scope for the cumulative impacts analysis for wetlands consists of the boundaries of Logan City, as the area over which the city has planning and zoning jurisdiction The extent of the existence of wetlands within the city boundaries in unknown so it is possible that future development in the Logan area could potentially impact additional wetlands, especially in the vicinity of the project area; however, based upon the USACE's policy of "no net loss" to wetlands, it is unlikely that future public projects in the area would have a substantial impact on wetlands within the city boundaries.

Socio-Economic Conditions

For the socio-economic conditions cumulative effect analysis, the geographic scope includes service area for the Logan WWTP. The cities that compromise the service area for this particular facility include the majority of the population of Cache County. According to population projections put together by the Governor's Office of Planning and Budget, Cache County in anticipated to grow from a population of

113,273 in 2010 to 196,559 by 2040. This population increase would likely be accompanied by an increase in retail and commercial enterprises in the area.

The existing facility has the capacity to service the needs of the service area through 2040. The project is intended to comply with the EPA's TMDL for Cutler Reservoir, rather than be based upon providing adequate service to accommodate population growth; however, the new facility would be designed to accommodate the anticipated population growth as well. Other projects in Cache County would be included as part of the municipal planning activities of the various cities included in the service area.

Visual and Aesthetics

For the visual cumulative effects analysis, the geographic scope includes the project area and the adjacent properties, including SR-30. The area is slated for use as a gateway to Logan City in Logan City's Future Land Use Plan, which means that the visual character of the area is important to Logan City. Future development in the project area will be addressed through the planning process and may result in a shift from agricultural lands to more urban development, but as such is still speculative at this point, it is not addressed further in this analysis.

3.15 Compliance with Environmental Laws and Regulations

Clean Air Act, as amended and recodified (42 U.S.C §7401 et seq.) *Compliance*: Section 176(c) requires that the Federal agencies ensure that their activities are in conformance with Federally-approved State Implementation Plans (SIPs) for areas designated as "non-attainment" and "maintenance." This project is located in a non-attainment area for $PM_{2.5}$, but the project is not expected to violate any Federal or State air quality standards or hinder the attainment of air quality objectives in the local air basin.

Clean Water Act (33 U.S. C. §1251 et seq.) *Compliance*: The project would involve impacts to wetlands; therefore a Section 404 Permit will be obtained from the USACE. Mitigation measures would also be implemented. The project would also require a UPDES permit from the DWQ since it would disturb one or more acres of land and involve potential stormwater discharges to surface waters during construction.

Endangered Species Act (16 U.S.C. 1531 et seq.) *Compliance*: No Federally-listed threatened or endangered species or their habitats were identified in or near the project area. As a result, the project would have no effect on any Federally-listed species.

Executive Order 11988, Floodplain Management. *Compliance*: This order directs all Federal agencies to avoid (to the extent possible) any adverse effects of modifying floodplains and to avoid support of floodplain development when there is a practicable alternative. This project would not alter or otherwise impair the floodplains in the project area.

Executive Order 11990, Wetlands. *Compliance*: This order directs all Federal agencies to minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. This project would impact wetlands; however, the alternative chosen is the least environmentally damaging practicable alternative. Further, mitigation measures will be taken to create/restore wetlands, resulting in an overall net gain.

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. *Compliance*: This order directs all Federal agencies to identify any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and/or low-income populations. This project would not have any disproportionately high and adverse impacts on minority or low-income populations.

Executive Order 13112, Invasive Species. *Compliance*: This order directs all Federal agencies to minimize the spread and introduction of invasive species. BMPs would be implemented during the construction of the project to minimize the possibility of any alien species being introduced.

Farmland Protection Policy Act (7 U.S.C. 4201). Compliance: This project would impact Prime, Unique, or Statewide Important Farmland; however, the proposed project had an impact rating of 157, which is less than the 160 points that would indicate an adverse impact to farmlands sufficient to require the consideration of avoidance and mitigation alternatives. Coordination with the NRCS was undertaken as part of the EA.

Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) *Compliance*: This act requires consultation with the USFWS and the fish and wildlife agencies of States where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified" by any agency under a Federal permit or license to prevent loss of or damage to wildlife resources. The project will re-route a minor irrigation canal but the new alignment would not vary far from its current location. Further, coordination has been undertaken with the USFWS and with the UDWR.

Migratory Bird Treaty Act (15 U.S.C. 701-18H). *Compliance*: This act requires that the project avoid destruction of active bird nests or the young of migratory birds that breed in the area from March to August. The Migratory Bird Treaty Act specifically prohibits anyone to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird." (16 U.S.C. 703).

Migratory birds are attracted to the existing lagoons; however, no suitable nesting habitat was identified during the presence/absence survey conducted in connection with this project. Further, construction crews would be advised as to the restrictions of the Migratory Bird Treaty Act so as to not violate its provisions during construction, should any migratory birds or nests be discovered.

National Environmental Policy Act (42 U.S.C. 4321 et seq.). *Compliance*: The Draft EA will be released for public review and comment, as required by NEPA and a Finding of No Significant Impact (FONSI) will be issued, if the proposed project is found to have no significant impact on the human or natural environment.

National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 et seq.). *Compliance*: No cultural resources were identified in the project area; therefore, the project has been determined to have a No Historic Properties Affected determination by Utah Division of Drinking Water, which was concurred with by the Utah SHPO on November 7, 2013. Consultation with Native American tribes was also undertaken in connection with this project.

3.16 Public Involvement

No public meetings have been held in connection with this EA to date; however, public input into the Proposed Action, including the need for the project, has been solicited throughout the development of the project, including but not limited to the following:

- Logan City Municipal Council meetings
  - March 6, 2012
  - September 18, 2012
  - May 22, 2012
  - February 19, 2013
  - June 25, 2013
  - October 20, 2015 (minutes pending)
  - November 3, 2015

A request for public input into the project was published by Logan City in The Herald Journal, a daily newspaper in general circulation in the project area. Notice was provided that a 30-day public comment period regarding the proposed project began on August 29, 2015. See the Proof of Publication in Correspondence.

3.17 Coordination and Review of the EA

This EA will be circulated for thirty (30) days to agencies, organizations, and individuals known to have an interest in the project. All comments received will be considered and incorporated into the EA, as appropriate.

This project has been coordinated with the following agencies:

- Natural Resources Conservation Service (NRCS)
- United States Army Corps of Engineers (USACE)
- United States Fish and Wildlife Service (USFWS)
- Utah State Historic Preservation Office (SHPO)

3.18 Correspondence

The following correspondence was sent/received in connection with this project:

Table 11. Correspondence

Date	Addressed To	From	Subject
9/26/2012	Issa Hamud Logan City	Walter Baker Utah DWQ	UPDES Permit No. UT0021920 – New Proposed Ammonia Limits
1/31/2013	Issa Hamud Logan City	Walter Baker Utah DWQ	UPDES Permit No. UT0021920 – New Proposed Ammonia Limits
2/6/2013	Issa Hamud Logan City	John Mackey Utah DWQ	Logan Wastewater Treatment Master Plan
11/7/2013	William Damery Utah DWQ	Chris Merrit Utah SHPO	Section 106 Determination Concurrence
12/12/2013	Issa Hamud City of Logan	Jason Gipson USACE	Preliminary Jurisdictional Determination/Section 404 Permit Application
2/14/2014	Walt Baker Utah DWQ	Mayors of North Logan, Hyde Park, Smithfield, River Heights, Nibley, and Providence	Objections to Proposed Logan Wastewater Facilities Project and Support for Formation of New Sewer District
6/25/2014	Judy Imlay Horrocks Engineers	Mike Domeier NRCS	Prime, Unique and Statewide Important Farmland
7/11/2014	Larry Crist USFWS	Judy Imlay Horrocks Engineers	Request for Threatened and Endangered Species Effect Determination Concurrence
8/21/2015	Claudia Cottle Bear Lake Watch	Jim Harps Logan City	Request for Comments

Identical letters sent to:

- Dan Davidson, Bear River Canal Company
- Charles Holmgren, Bear River Canal Company

Date	Addressed To	From	Subject

- Jack Barnett, Bear River Commission
- Dan Miller, Bear River Watershed Council
- Jon White, Blacksmith Fork SCD
- Sande Emile, Cache Chamber of Commerce
- Richard Mueller, Bridgerland Audobon Society
- Bryan Dixon, Bridgerland Audobon Society
- Craig Buttars, Cache County Executive
- Bob Fotheringham, Cache County Water Department
- Craig Miller, Utah Division of Natural Resources – Water Resources
- Terry Howick/Doug Routledge/Paul Thompson, Utah Department of Natural Resources
- Eve Davies/Connely Baldwin, PacifiCorp

8/26/2015	Georgetta Wood Shivwits Band of Paiute Indian Tribe of Utah	Jim Harps Logan City	Native American consultation

Identical letters sent to:

- Shanan Anderson, Shivwits Band of Paiute Indian Tribe of Utah
- Darwin St. Clair, Jr., Eastern Shoshone Tribe of the Wind River Reservation
- Glenda Trosper, Eastern Shoshone Tribe of the Wind River Reservation
- Wilfred Ferris, Eastern Shoshone Tribe of the Wind River Reservation
- Nathan Small, Shoshone-Bannock Tribes of Fort Hall
- Carolyn Smith, Shoshone-Bannock Tribes of Fort Hall
- Gari Lafferty, Paiute Indian Tribe of Utah
- Dorena Martineau, Paiute Indian Tribe of Utah
- Jason Walker, Northwestern Band of Shoshone Nation
- Patty Timbimboo-Madsen, Northwestern Band of Shoshone Nation
- Gordon Howell, Ute Indian Tribe of the Uintah and Ouray Ute Indian Reservation
- Betsy Chapoose, Ute Indian Tribe of the Uintah and Ouray Ute Indian Reservation
- Lori Bear Skiby, Skull Valley Band of Goshute Indians
- Ed Naranjo, Confederated Tribes of the Goshute Reservation
- Mary Pete-Freeman, Confederated Tribes of the Goshute Reservation
- Lora Tom, Cedar Band of Paiutes
- Vala Parashonts, Cedar Band of Paiutes

8/26/2015	Lonnie Shull UDWQ	Jim Harps Logan City	Request for Comments
8/26/2015	Mike Allred UDWQ	Jim Harps Logan City	Request for Comments
8/26/2015	Bill Young Logan City Public Works	Jim Harps Logan City	Request for Comments

Identical letters sent to:

- Kris Peterson, UDOT
- Kevin Maughan, Hyrum City Sewage Treatment
- Joseph Larsen, Newton Reservoir Advisory Committee

Date	Addressed To	From	Subject
• Bruce Karren, North Cache Conservation District • Jon Hardman, [National] Resources Conservation Service • Justin Elsner, Utah State University (USU) Extension • Nathan Daugs/Bracken Henderson, Utah Association of Conservation Districts • Bob Barrett/Sharon Vaughn, U.S. Fish and Wildlife Service • Clark Israelsen, USU Cache County Extension • Nancy Mesner, USU Water Quality Extension • Scott Miller, USU Director, National Aquatic Monitoring Center • Phaedra Budy, Utah State University • Wayne Wurtsbaugh, Utah State University • Rhonda Miller, Utah State University • Arthur Caplan, Utah State University • Fred Selman, Northern Utah Conservation District • Don Hartle, Wellsville City • Jim Watterson • Mark Peterson, Utah Farm Bureau – Water Quality Programs • Paul Thompson/Ben Nadolski, Utah Division of Wildlife Resources • Joan Degirogio, The Nature Conservancy • Kayo Robertson • Peter Kung, Logan River Water Users Association • Darek Kimball/Paul Taylor, JUB Engineering • Don Summit/Doug Stipes, EA Miller/Swift • Bruce Lindquist, Cache County Farm Service Agency • Greg Rowley, Gossner Foods • Paul Leishman • Val Grant			
8/27/2015	Clinton Rogers Carollo Engineers	Greg Colton	Comments on Project (phone call)
8/28/2015	Clinton Rogers Carollo Engineers	Sandy Emile Cache Chamber of Commerce	Comments on Project
8/31/2015	Clinton Rogers Carollo Engineers	Michael Domeier NRCS	Farmland Conversion Impact Rating Form
8/31/2015	Clinton Rogers Carollo Engineers	Bob Fatheringham	Comments on Project
9/10/2015	Clinton Rogers Carollo Engineers	Richard Mueller Bridgerland Audobon Society	Comments on Project
9/11/2015	Clinton Rogers Carollo Engineers	Arthur J. Caplan Utah State University	Comments on Project
9/15/2015	Clinton Rogers Carollo Engineers	Joseph G. Larson	Comment on Project

Date	Addressed To	From	Subject
9/17/2015	Clinton Rogers Carollo Engineers	Eve Davies PacifiCorp	Request for Further Information
9/19/2015	Clinton Rogers Carollo Engineers	Peter E. Kung	Comments on Project
9/23/2015	Clinton Rogers Carollo Engineers	Bracken Henderson North Cache Conservation District	Comments on Project
9/28/2015	Clinton Rogers Carollo Engineers	Eve Davies PacifiCorp	Comments on Project
9/28/2015	Clinton Rogers Carollo Engineers	Don Summit JBS	Comments on Project
9/28/2015	Clinton Rogers Carollo Engineers	Bryan Dixon	Comments on Project
10/23/2015	Clinton Rogers Carollo Engineers	Betsy Hermann USFWS	Comments on Threatened and Endangered Species
11/03/2015	Richard Mueller Bridgerland Audobon Society	Jim Harps Logan City	Response to Comment
11/03/2015	Arthur J. Caplan Utah State University	Jim Harps Logan City	Response to Comment
11/03/2015	Joseph G. Larson	Jim Harps Logan City	Response to Comment
11/03/2015	Peter E. Kung	Jim Harps Logan City	Response to Comment
11/03/2015	Bracken Henderson North Cache Conservation District	Jim Harps Logan City	Response to Comment
11/03/2015	Eve Davies PacifiCorp	Jim Harps Logan City	Response to Comment
11/03/2015	Don Summit JBS	Jim Harps Logan City	Response to Comment
11/03/2015	Bryan Dixon	Jim Harps Logan City	Response to Comment

4.0 LIST OF PREPARERS

Name	Organization	Project Role	Education	Years of Experience
Jennifer Hale	Horrocks Engineers	Environmental Analysis/Graphics	BA, Humanities MLA, Landscape Architecture	7
Judy Imlay	Horrocks Engineers	Environmental Analysis	BA, Political Science JD	18
Stan Jorgensen	Horrocks Engineers	Environmental Manager	BS, Civil Engineering MS, Civil Engineering	21
Ryan Pitts	Horrocks Engineers	Environmental Analysis	BS, Horticulture MLA, Landscape Architecture	8

Contributors

- Clinton Rogers, Carollo Engineers

5.0 REFERENCES

A Selective Reconnaissance-Level Survey of Architectural Resources for the Logan Wastewater Treatment Facility Project, Logan, Cache County, Utah

An Archaeological Resource Investigation of the Logan Wastewater Treatment Facility Project, Logan, Cache County, Utah

Bear River Watershed Information System. Bear River Watershed Description. Retrieved from http://bearriverinfo.org/htm/bear-river-watershed-description on June 5, 2014.

Geotechnical Investigation, Logan Wastewater Treatment Plant Improvement Project, 2600 West 200 North, Logan, Utah

Logan City Wastewater Treatment Master Plan Update 2013

Logan City Wastewater Treatment Facility Threatened and Endangered Species Effects Determination Report, Cache County, Utah

Logan Wastewater Treatment Facility Wetland Delineation and Waters of the U.S. Report

Middle Bear River and Cutler Reservoir Total Maximum Daily Load (TMDL)

Phase I ESA Proposed Waste Water Treatment Facility, 2300 West Highway 30, Logan, Utah

U.S. Fish and Wildlife Service. Least Chub. Endangered Species of the Mountain-Prairie Region. Retrieved from http://www.fws.gov/mountain-prairie/species/fish/leastchub/ on August 8, 2014.

CORRESPONDENCE

State of Utah

GARY R. HERBERT
Governor

GREG BELL
Lieutenant Governor

Department of
Environmental Quality

Amanda Smith
Executive Director

DIVISION OF WATER QUALITY
Walter L. Baker, P.E.
Director

SEP 2 6 2012

Issa Hamud
Environmental Department
Logan City Corporation
450 North 1000 West
Logan UT 84321

Dear ~~Mr. Hamud~~ Issa:

Subject: New Proposed Ammonia Limits, Logan City Lagoons UT0021920

The purpose of this letter is to inform you of an anticipated change to the ammonia limits in the Logan City Corporation Wastewater Treatment Plant's UPDES permit renewal due later this year. The modification to the ammonia limit is necessitated by a rule change required by EPA and adopted by the Water Quality Board in October 2008 which extended the chronic ammonia criteria from 3A and 3B waters to include 3C and 3D waters.

In the current permit, Outfall 002 to Swift Slough only has an acute ammonia limit (maximum daily concentration) and does not have a chronic ammonia limit (30-day average concentration) due to the fact that the designated beneficial use of the receiving water in the waste load analysis was 3C[1] (for aquatic life use) and did not have a chronic ammonia criterion in the water quality standards at the time of the permit issuance.

The change in chronic ammonia standards may result in ammonia limits that may be difficult to meet with the current lagoons and finishing wetlands treatment operations, as well as the phased construction of a mechanical treatment plant. While the final limit is still being developed, we anticipate it will be in the range of 2.0 to 3.0 mg/l from Outfall 002. As part of this process, the Division of Water Quality is in the process of calculating ammonia numbers from Outfall 001 and will be in close communication with Logan City with regards to those values. Given the treatment required to meet this rather stringent acute ammonia limit, DWQ will continue to work with you to resolve this issue and help facilitate your ability to comply with future permit limits through a compliance schedule or other similar means.

[1] Note that per UAC R317-2-13.3.a, the aquatic life use for Swift Slough should be 3B and 3D instead of 3C. The source of the 3C designation in the previous permit is unknown.

195 North 1950 West • Salt Lake City, UT
Mailing Address: P.O. Box 144870 • Salt Lake City, UT 84114-4870
Telephone (801) 536-4300 • Fax (801) 536-4301 • T.D.D. (801) 536-4414
www.deq.utah.gov

We appreciate the efforts that Logan City is undertaking to address the water quality of Cutler Reservoir. If you have any questions regarding this matter, please contact Mr. Lonnie Shull at (801) 536-4394, or via e-mail at lshull@utah.gov.

Sincerely,

Walter L. Baker, P.E.
Director

WLB:NvS:ls:mc

DWQ-2012-002762

State of Utah
GARY R. HERBERT
Governor
GREG BELL
Lieutenant Governor

Department of
Environmental Quality
Amanda Smith
Executive Director
DIVISION OF WATER QUALITY
Walter L. Baker, P.E.
Director

FILE COPY

Document Date 1/31/2013
DWQ-2013-001385

JAN 3 1 2013

Issa Hamud
Environmental Department
Logan City Corporation
450 North 1000 West
Logan UT 84321

Dear Mr. Hamud:

Subject: New Proposed Ammonia Limits for Logan City Lagoons UPDES Permit No. UT0021920

On September 26, 2012, we notified Logan City Corporation as to an anticipated change to the ammonia limits in the Logan City Corporation Wastewater Treatment Plant's UPDES permit. As stated in the previous letter, these changes were necessitated by a rule change required by EPA and adopted by the Water Quality Board in October 2008 which extended the chronic ammonia criteria from 3A and 3B waters to include 3C and 3D waters.

After much discussion and collaboration with Logan City that resulted in incorporating many new data sources, the Division has established ammonia limits in a draft wasteload analysis. The wasteload analysis was conducted for projected effluent flows and quality in 2037, which were provided by Carollo Engineers assuming a hybrid facility with a 12 MGD mechanical treatment plant in combination with the existing lagoons. Note that should the projected effluent flow or quality (temperature, pH, and alkalinity) change appreciably during the planning and engineering process, the limits may need to be revisited and modified. The wasteload established the following effluent limits for Logan's discharge:

Logan Utah Expected Effluent Limits for Ammonia, mg/L

Season:	Winter	Spring	Summer	Fall
Monthly Average	3.0	3.0	1.3	2.6
Daily Maximum	5.0	8.0	6.0	7.0

The complete wasteload analysis is attached to this letter. The WLA is part of the draft permit package and will be subject to a 30 day public comment period to be scheduled in the coming weeks, along with the renewal permit and fact sheet and statement of basis.

We appreciate the efforts that Logan City is undertaking to address the water quality of Cutler Reservoir. If you have any questions regarding this matter, please contact Mr. Lonnie Shull at (801) 536-4394, or via e-mail at lshull@utah.gov.

Sincerely,

Walter L. Baker, P.E.
Director

WLB:NvS:ls:mc ls mc

Enclosure: 1. WLA, (DWQ-2013-00-1297)

cc: John Mackey, DWQ (w/o encl)

DWQ-2013-001296

FILE COPY

Utah Division of Water Quality
Statement of Basis
ADDENDUM
Wasteload Analysis and Antidegradation Level I Review
TREATMENT PLANT UPGRADE – PHASE 1 TO 2037

Date: **January 10, 2013**

Prepared by: **Nicholas von Stackelberg, P.E.**
Water Quality Management Section

Facility: **Logan Wastewater Treatment Plant, Logan, UT**
UPDES No. UT0021920

Receiving water: **Swift Slough (2B, 3B, 3D, 4)**

This addendum summarizes the wasteload analysis that was performed to determine water quality based effluent limits (WQBEL) for this discharge. Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on in-stream water quality. The wasteload analysis also takes into account downstream designated uses (UAC R317-2-8). Projected concentrations are compared to numeric water quality standards to determine acceptability. The numeric criteria in this wasteload analysis may be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

<u>Discharge</u>
This wasteload is for the proposed treatment plant upgrade for phase 1 to 2037. The proposed project involves construction of a mechanical treatment plant with a design capacity of 12 MGD. The remainder of flows would be treated by the existing lagoon system. The existing polishing wetlands would no longer be used for wastewater treatment.

Design data for the treatment facility was provided by Carollo Engineers under contract to Logan City. The design parameters for the discharge are summarized in Table 1 for the year 2037.

Table 1: Discharge in 2037

Duration	Flow (MGD)		pH		Temperature (deg C)	
	Max. Daily	Max. Monthly	Max. Daily	Max. Monthly	Max. Daily	Max. Monthly
Summer (Jun-Aug)	25.4	23.7	8.2	8.1	20.0	19.9
Fall (Sep-Nov)	25.4	20.5	8.2	8.0	14.7	15.4
Winter (Dec-Feb)	35.0	20.3	8.4	8.0	4.7	6.9
Spring (Mar May)	21.3	16.5	8.0	7.8	12.3	12.6

Outfall 001: Unnamed Irrigation Ditch→Swift Slough

Receiving Water
The receiving water for Outfall 001 is an unnamed irrigation ditch that will convey the effluent from the treatment plant to Swift Slough. The beneficial uses for the irrigation ditch are presumed 2B, 3E, and 4 per UAC R317-2-13.9. The irrigation ditch has no background flow during critical conditions.

- *Class 2B - Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.*
- *Class 3E - Severely habitat-limited waters. Narrative standards will be applied to protect these waters for aquatic wildlife.*
- *Class 4 - Protected for agricultural uses including irrigation of crops and stock watering.*

The unnamed irrigation ditch drains approximately 2.8 miles to Swift Slough. Swift Slough is tributary to Cutler Reservoir. Per UAC R317-2-13.3.a, the designated beneficial uses for Swift Slough (Bear River and tributaries, from Great Salt Lake to Utah-Idaho border) are 2B, 3B, 3D, and 4.

- *Class 2B - Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.*
- *Class 3B - Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.*
- *Class 3D - Protected for waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.*
- *Class 4 - Protected for agricultural uses including irrigation of crops and stock watering.*

Typically, the critical flow for the wasteload analysis is considered the lowest stream flow for seven consecutive days with a ten year return frequency (7Q10). Flow records from Swift Slough immediately upstream of Outfall 002 were provided by Logan City for the years 2004-2010. Since this is not a long enough flow record to compute the 7Q10 flow, the lowest 7-day average flow while the wetlands were discharging for each season was used (Table 2).

Table 2: Seasonal critical low flow

Season	Background Flow (cfs)	
	Ditch	Swift Slough
Summer	0.0	4.0
Fall	0.0	8.4
Winter	0.0	8.8
Spring	0.0	2.9

TMDL

Cutler Reservoir has an approved TMDL for total phosphorus (TP) (*Middle Bear River and Cutler Reservoir TMDLs, 2010*). The TMDL allocated load for TP from Logan City Wastewater Treatment Plant is 4,405 kg for May through October and 11,831 kg for November through April.

Mixing Zone

The discharge is considered instantaneously fully mixed since the discharge is more than twice the background receiving water flow. Therefore, no mixing zone is allowed.

Parameters of Concern

The potential parameters of concern identified for the discharge/receiving water were total suspended solids (TSS), dissolved oxygen (DO), BOD5, total phosphorus (TP), total nitrogen (TN), total ammonia (TAM), E. coli, pH, total residual chlorine (TRC), total copper, and total lead as determined in consultation with the UPDES Permit Writer.

Water Quality Modeling

A QUAL2Kw model of the receiving water was built and calibrated. The model was calibrated to synoptic survey data collected in September of 2011 by DWQ staff.

Receiving water quality data was primarily obtained from the synoptic survey conducted for the model calibration from 9/15 to 9/19/2011. The sampling site was on the Swift Slough immediately above the plant discharge. Limited water quality data was obtained from STORET 4905050 Swift Slough below confluence with Logan Lagoons Effluent and STORET 4905070 Swift Slough at 1300 West. The average value was calculated for each constituent in the receiving water.

The calibrated model was used for determining WQBELs. Effluent concentrations were adjusted so that water quality standards were not exceeded at the end of the mixing zone. The calibration model and the wasteload model are available for review by request.

WET Limits

The percent of effluent in the receiving water in a fully mixed condition, and acute and chronic dilution in a not fully mixed condition are calculated in the WLA in order to generate WET limits. The LC_{50} (lethal concentration, 50%) percent effluent for acute toxicity and the IC_{25} (inhibition concentration, 25%) percent effluent for chronic toxicity, as determined by the WET test, needs to be below the WET limits, as determined by the WLA. The WET limit for LC_{50} is typically 100% effluent and does not need to be determined by the WLA.

Table 3: WET Limits

Season	Percent Effluent
Summer	91%
Fall	82%
Winter	81%
Spring	93%

Effluent Limits

The effect of the effluent on the DO in the receiving water was evaluated using the QUAL2Kw model. Due to light and substrate limitation, significant algal growth downstream of the discharge was neither observed nor predicted in the model. Therefore, WQBELs are not required for nitrogen and phosphorus due to algal growth in the Swift Slough. However, as a result of the TMDL for Cutler Reservoir, effluent limits are required for TP. In addition, limits are required for DO to meet instream criteria.

Limits for total residual chlorine were not determined since the proposed treatment plant includes ultraviolet radiation for disinfection.

Table 4: Water Quality Based Effluent Limits

Effluent Constituent	Acute			Chronic		
	Standard	Limit	Averaging Period	Standard	Limit	Averaging Period
Ammonia (mg/L)[1]						
Summer	Varies with pH	6.0	1 hour	Varies with pH and temper-ature	1.3	30 days
Fall		7.0			2.6	
Winter		5.0			3.0	
Spring		8.0			3.0	
Min. Dissolved Oxygen (mg/L)	3.0	5.0	Instantaneous	5.5	5.5	30 days
BOD_5 (mg/L)[2]	None	25	7 days	None	35	30 days
1: Ammonia limit due to toxicity requirements.						

QUAL2Kw rates, input and output for DO and nutrient related constituents are summarized in Appendix A.

Simple mixing analysis input and output for conservative constituents are summarized in Appendix B.

Effluent limits for Outfall 001 are summarized in Appendix C.

Models and supporting documentation are available for review upon request.

Antidegradation Level I Review

The objective of the Level I ADR is to ensure the protection of existing uses, defined as the beneficial uses attained in the receiving water on or after November 28, 1975. No evidence is known that the existing uses deviate from the designated beneficial uses for the receiving water. Therefore, the beneficial uses will be protected if the discharge remain below the WQBELs presented in this wasteload.

A Level II Antidegradation Review (ADR) is required for this discharge since the allowable pollutant load will increase with the treatment plant upgrade.

WLA Document: *logan_potw_wla_upgrade_2037_final.docx*
QUAL2Kw Wasteload Model: *logan_potw_wla_upgrade_2037.xlsm*
QUAL2Kw Calibration Model: *logan_q2k_cal_1.3.xlsm*

Utah Division of Water Quality

WASTELOAD ANALYSIS [WLA] Date: 1/9/2013
Appendix A: QUAL2Kw Analysis Results

Discharging Facility:	Logan WWTP		
UPDES No:	UT-0021920		
Permit Flow [MGD]:	25.40	Summer (July-Sept)	Max. Daily
	25.40	Fall (Oct-Dec)	Max. Daily
	35.00	Winter (Jan-Mar)	Max. Daily
	21.30	Spring (Apr-June)	Max. Daily
	23.70	Summer (July-Sept)	Max. Monthly
	20.50	Fall (Oct-Dec)	Max. Monthly
	20.30	Winter (Jan-Mar)	Max. Monthly
	16.50	Spring (Apr-June)	Max. Monthly

Receiving Water:	Swift Slough	
Stream Classification:	2B, 3B, 3D, 4	
Stream Critical Low Flow [cfs]:	3.98	Summer (July-Sept)
	8.40	Fall (Oct-Dec)
	8.82	Winter (Jan-Mar)
	2.88	Spring (Apr-June)

Fully Mixed:	YES
Acute River Width:	100%
Chronic River Width:	100%

Modeling Information

A QUAL2Kw model was used to determine these effluent limits.

Model Inputs

The following is upstream and discharge information that was utilized as inputs for the analysis.
Dry washes are considered to have an upstream flow equal to the flow of the discharge.

Headwater/Upstream Information	Summer	Fall	Winter	Spring
Flow (cfs)	4.0	8.4	8.8	2.9
Temperature (deg C)	21.6	12.3	1.5	14.9
Specific Conductance (μmhos)	850	610	533	619
Inorganic Suspended Solids (mg/L)	26.5	26.5	26.5	26.5
Dissolved Oxygen (mg/L)	5.8	9.0	12.1	9.4
$CBOD_5$ (mg/L)	4.4	4.4	4.4	4.4
Organic Nitrogen (mg/L)	0.084	0.084	0.084	0.084
NH4-Nitrogen (mg/L)	0.025	0.025	0.025	0.025
NO3-Nitrogen (mg/L)	0.270	0.270	0.270	0.270
Organic Phosphorus (mg/L)	0.025	0.025	0.025	0.025
Inorganic Ortho-Phosphorus (mg/L)	0.025	0.025	0.025	0.025
Phytoplankton (μg/L)	2.6	2.6	2.6	2.6
Detritus [POM] (mg/L)	3.6	3.6	3.6	3.6
Alkalinity (mg/L)	225	225	225	225
pH	8.1	8.0	8.0	8.2

Discharge Information				
Acute	**Summer**	**Fall**	**Winter**	**Spring**
Flow (cfs)	25.4	25.4	35.0	21.3
Temperature (deg C)	20.0	14.7	4.7	12.3
Specific Conductance (μmhos)	735	735	735	735
Inorganic Suspended Solids (mg/L)	35.7	35.7	35.7	35.7
Dissolved Oxygen (mg/L)	5.0	5.0	5.0	5.0
$CBOD_5$ (mg/L)	35.0	35.0	35.0	35.0
Organic Nitrogen (mg/L)	5.000	5.000	5.000	5.000
NH4-Nitrogen (mg/L)	6.000	7.000	5.000	8.000
NO3-Nitrogen (mg/L)	5.000	5.000	5.000	5.000
Organic Phosphorus (mg/L)	5.000	5.000	5.000	5.000
Inorganic Ortho-Phosphorus (mg/L)	5.000	5.000	5.000	5.000
Phytoplankton (μg/L)	168.000	168.000	168.000	168.000
Detritus [POM] (mg/L)	0.000	0.000	0.000	0.000
Alkalinity (mg/L)	272	272	272	272
pH	8.2	8.2	8.4	8.0

Chronic	**Summer**	**Fall**	**Winter**	**Spring**
Flow (cfs)	23.7	20.5	20.3	16.5
Temperature (deg C)	19.9	15.4	6.9	12.6
Specific Conductance (μmhos)	735	735	735	735
Inorganic Suspended Solids (mg/L)	35.7	35.7	35.7	35.7
Dissolved Oxygen (mg/L)	5.5	5.5	5.5	5.5
$CBOD_5$ (mg/L)	25.0	25.0	25.0	25.0
Organic Nitrogen (mg/L)	5.000	5.000	5.000	5.000
NH4-Nitrogen (mg/L)	1.300	2.600	3.000	3.000
NO3-Nitrogen (mg/L)	5.000	5.000	5.000	5.000
Organic Phosphorus (mg/L)	5.000	5.000	5.000	5.000
Inorganic Ortho-Phosphorus (mg/L)	5.000	5.000	5.000	5.000
Phytoplankton (μg/L)	168.000	168.000	168.000	168.000
Detritus [POM] (mg/L)	0.000	0.000	0.000	0.000
Alkalinity (mg/L)	272	272	272	272
pH	8.1	8.0	7.9	7.8

All model numerical inputs, intermediate calculations, outputs and graphs are available for review and comment at the Division of Water Quality.

Effluent Limitations

Current State water quality standards are required to be met under a variety of conditions including in-stream flows targeted to the 7-day, 10-year low flow (R317-2-9).

Other conditions used in the modeling effort reflect the environmental conditions expected at low stream flows.

Effluent Limitation for Biological Oxygen Demand (BOD_5) based upon Secondary Standards

In-stream criteria of downstream segments for Dissolved Oxygen will be met with an effluent BOD_5 limitation as follows:

	Concentration		
Season	**Chronic**	**Acute**	
Summer	25.0	35.0	mg/L as CBOD5
Fall	25.0	35.0	mg/L as CBOD5
Winter	25.0	35.0	mg/L as CBOD5
Spring	25.0	35.0	mg/L as CBOD5

Effluent Limitation for Dissolved Oxygen (DO) based upon Water Quality Standards
In-stream criteria of downstream segments for Dissolved Oxygen will be met with an effluent DO limitation as follows:

	Dissolved Oxygen		
Season	Chronic	Acute	
Summer	5.5	5.0	mg/L
Fall	5.5	5.0	mg/L
Winter	5.5	5.0	mg/L
Spring	5.5	5.0	mg/L

Effluent Limitation for Total Phosphorus based upon TMDL
In-stream criteria of downstream segments for Dissolved Oxygen will be met with effluent TP limitation as follows:

	Total Phosphorus	
Season	Load	
May - October	4,405	kg
November - April	11,831	kg

Effluent Limitation for Total Ammonia based upon Water Quality Standards
In-stream criteria of downstream segments for Total Ammonia will be met with an effluent limitation (expressed as Total Ammonia as N) as follows:

	Total Ammonia		
Season	Chronic	Acute	
Summer	1.3	6.0	mg/L as N
Fall	2.6	7.0	mg/L as N
Winter	3.0	5.0	mg/L as N
Spring	3.0	8.0	mg/L as N

Summary Comments
The mathematical modeling and best professional judgement indicate that violations of receiving water beneficial uses with their associated water quality standards, including important down-stream segments, will not occur for the evaluated parameters of concern as discussed above if the effluent limitations indicated above are met.

Coefficients and Other Model Information

Parameter	*Value*	*Units*
Stoichiometry:		
Carbon	40	gC
Nitrogen	7.2	gN
Phosphorus	1	gP
Dry weight	100	gD
Chlorophyll	1	gA
Inorganic suspended solids:		
Settling velocity	2	m/d
Oxygen:		
Reaeration model	Internal	
Temp correction	1.024	
Reaeration wind effect	None	
O2 for carbon oxidation	2.69	gO2/gC
O2 for NH4 nitrification	4.57	gO2/gN
Oxygen inhib model CBOD oxidation	Exponential	
Oxygen inhib parameter CBOD oxidation	0.60	L/mgO2
Oxygen inhib model nitrification	Exponential	
Oxygen inhib parameter nitrification	0.60	L/mgO2
Oxygen enhance model denitrification	Exponential	
Oxygen enhance parameter denitrification	0.60	L/mgO2
Oxygen inhib model phyto resp	Exponential	
Oxygen inhib parameter phyto resp	0.60	L/mgO2
Oxygen enhance model bot alg resp	Exponential	
Oxygen enhance parameter bot alg resp	0.60	L/mgO2
Slow CBOD:		
Hydrolysis rate	0	/d
Temp correction	1.047	
Oxidation rate	0.240778	/d
Temp correction	1.047	
Fast CBOD:		
Oxidation rate	10	/d
Temp correction	1.047	
Organic N:		
Hydrolysis	0.2964425	/d
Temp correction	1.07	
Settling velocity	0.147494	m/d
Ammonium:		
Nitrification	0.0772945	/d
Temp correction	1.07	
Nitrate:		
Denitrification	1.8113375	/d
Temp correction	1.07	
Sed denitrification transfer coeff	0.22471	m/d
Temp correction	1.07	
Organic P:		
Hydrolysis	0.1360275	/d
Temp correction	1.07	
Settling velocity	0.11495	m/d
Inorganic P:		
Settling velocity	0.02022	m/d
Sed P oxygen attenuation half sat constant	1.40616	mgO2/L

Phytoplankton:		
Max Growth rate	1.99746	/d
Temp correction	1.07	
Respiration rate	0.49199	/d
Temp correction	1.07	
Death rate	0.97217	/d
Temp correction	1	
Nitrogen half sat constant	22.0366	ugN/L
Phosphorus half sat constant	1.95708	ugP/L
Inorganic carbon half sat constant	1.30E-05	moles/L
Phytoplankton use HCO3- as substrate	Yes	
Light model	Smith	
Light constant	97.3006	langleys/d
Ammonia preference	27.86895	ugN/L
Settling velocity	0.326705	m/d
Bottom Plants:		
Growth model	Zero-order	
Max Growth rate	7.262455	gD/m2/d or /d
Temp correction	1.07	
First-order model carrying capacity	100	gD/m2
Basal respiration rate	0.1455158	/d
Photo-respiration rate parameter	0.39	unitless
Temp correction	1.07	
Excretion rate	0.202475	/d
Temp correction	1.07	
Death rate	3.8662	/d
Temp correction	1.07	
External nitrogen half sat constant	288.016	ugN/L
External phosphorus half sat constant	98.1445	ugP/L
Inorganic carbon half sat constant	1.19E-04	moles/L
Bottom algae use HCO3- as substrate	Yes	
Light model	Half saturation	
Light constant	89.3608	langleys/d
Ammonia preference	21.65055	ugN/L
Subsistence quota for nitrogen	0.5779116	mgN/gD
Subsistence quota for phosphorus	0.1656965	mgP/gD
Maximum uptake rate for nitrogen	636.1775	mgN/gD/d
Maximum uptake rate for phosphorus	136.553	mgP/gD/d
Internal nitrogen half sat ratio	3.4205925	
Internal phosphorus half sat ratio	2.539308	
Nitrogen uptake water column fraction	1	
Phosphorus uptake water column fraction	1	
Detritus (POM):		
Dissolution rate	1.1092505	/d
Temp correction	1.07	
Settling velocity	0.125501	m/d
pH:		
Partial pressure of carbon dioxide	370	ppm

Atmospheric Inputs:	Summer	Fall	Winter	Spring
Max. Air Temperature, F	85.7	45.5	36.9	67.5
Min. Air Temperature, F	57.5	27.9	19.7	43.6
Dew Point, Temp., F	55.7	30.9	22.4	46.2
Wind, ft./sec. @ 21 ft.	5.7	3.5	3.2	5.6
Cloud Cover, %	0.1	0.1	0.1	0.1

Other Inputs:		
Bottom Algae Coverage	100.0%	
Bottom SOD Coverage	100.0%	
Prescribed SOD	0.0	gO2/m2/d

WASTELOAD ANALYSIS [WLA] Date: 1/9/2013
Appendix B: Simple Mixing Analysis for Conservative Constituents

Discharging Facility:	Logan WWTP		
UPDES No:	UT-0021920		
Permit Flow [MGD]:	25.40	Summer (July-Sept)	Max. Daily
	25.40	Fall (Oct-Dec)	Max. Daily
	35.00	Winter (Jan-Mar)	Max. Daily
	21.30	Spring (Apr-June)	Max. Daily
	23.70	Summer (July-Sept)	Max. Monthly
	20.50	Fall (Oct-Dec)	Max. Monthly
	20.30	Winter (Jan-Mar)	Max. Monthly
	16.50	Spring (Apr-June)	Max. Monthly

Receiving Water:	Unnamed Irrigation Ditch		
Stream Classification:	2B, 3E, 4		
Stream Flows [cfs]:	0.0	All Seasons	Critical Low Flow

Downstream Receiving Water:	Swift Slough		
Stream Classification:	2B, 3B, 3D, 4		
Stream Flows [cfs]:	3.98	Summer (Jun-Aug)	Critical Low Flow
	8.40	Fall (Sep-Nov)	
	8.82	Winter (Dec-Feb)	
	2.88	Spring (Mar-May)	

Fully Mixed:	YES
Acute River Width:	100%
Chronic River Width:	100%

Modeling Information

A simple mixing analysis was used to determine these effluent limits.

Model Inputs

The following is upstream and discharge information that was utilized as inputs for the analysis. Dry washes are considered to have an upstream flow equal to the flow of the discharge.

Headwater/Upstream Information

	Ditch	Swift Slough
	cfs	cfs
Summer	0.0	4.0
Fall	0.0	8.4
Winter	0.0	8.8
Spring	0.0	2.9

Discharge Information

	Flow MGD	
	Max. Daily	Monthly Ave.
Summer	25.4	23.7
Fall	25.4	20.5
Winter	35.0	20.3
Spring	21.3	16.5

All model numerical inputs, intermediate calculations, outputs and graphs are available for discussion, inspection and copy at the Division of Water Quality.

Effluent Limitations

Current State water quality standards are required to be met under a variety of conditions including in-stream flows targeted to the 7-day, 10-year low flow (R317-2-9).

Other conditions used in the modeling effort reflect the environmental conditions expected at low stream flows.

Effluent Limitations for Protection of Recreation (Class 2B Waters)

No dilution in unnamed irrigation ditch.

Physical Parameter	Maximum Concentration
pH Minimum	6.5
pH Maximum	9.0
Turbidity Increase (NTU)	10.0

Bacteriological	
E. coli (30 Day Geometric Mean)	206 (#/100 mL)
E. coli (Maximum)	668 (#/100 mL)

Effluent Limitations for Protection of Aquatic Wildlife (Class 3B Waters)

Dilution in Swift Slough - summer season flows used.

Physical Parameter	Maximum Concentration
Temperature (deg C)	27
Temperature Change (deg C)	4

Inorganics	Chronic Standard (4 Day Average)	Acute Standard (1 Hour Average)
Parameter	Standard	Standard
Phenol (mg/L)		0.010
Hydrogen Sulfide (Undissociated) [mg/L]		0.002

Dissolved Metals	Chronic Standard (4 Day Average)[1]			Acute Standard (1 Hour Average)[1]		
Parameter	Standard	Background[2]	Limit	Standard	Background[2]	Limit
Aluminum (µg/L)	87.0	58.3	90.1	750.0	58.3	820.0
Arsenic (µg/L)	150.0	100.5	155.4	340.0	100.5	364.2
Cadmium (µg/L)	0.5	0.3	0.5	4.9	0.3	5.4
Chromium VI (µg/L)	11.0	7.4	11.4	16.0	7.4	16.9
Chromium III (µg/L)	157.0	105.2	162.6	1206.7	105.2	1318.2
Copper (µg/L)	19.6	13.1	20.3	31.9	13.1	33.8
Cyanide (µg/L)	22.0	14.7	22.8	5.2	14.7	4.2
Iron (µg/L)				1000.0	670.0	1033.4
Lead (µg/L)	6.7	4.5	7.0	172.3	4.5	189.3
Mercury (µg/L)	0.012	0.008	0.012	2.4	0.0	2.6
Nickel (µg/L)	112.9	75.6	116.9	1016.5	75.6	1111.7
Selenium (µg/L)	4.6	3.1	4.8	18.4	3.1	19.9
Silver (µg/L)				15.6	10.4	16.1
Tributylin (µg/L)	0.072	0.048	0.075	0.46	0.05	0.50
Zinc (µg/L)	256.8	172.0	266.0	254.7	172.0	263.1

1: Based upon a Hardness of 250 mg/l as CaCO3
2: Background concentration assumed 67% of chronic standard

Organics [Pesticides]

Parameter	Chronic Standard (4 Day Average) Standard	Background[1]	Limit	Acute Standard (1 Hour Average) Standard	Background[1]	Limit
Aldrin (µg/L)				1.5	1.0	1.6
Chlordane (µg/L)	0.0043	0.0029	0.0045	1.2	0.0	1.3
DDT, DDE (µg/L)	0.001	0.001	0.001	0.55	0.00	0.61
Diazinon (µg/L)	0.17	0.11	0.18	0.17	0.11	0.18
Dieldrin (µg/L)	0.0056	0.0038	0.0058	0.24	0.00	0.26
Endosulfan, a & b (µg/L)	0.056	0.038	0.058	0.11	0.04	0.12
Endrin (µg/L)	0.036	0.024	0.037	0.086	0.024	0.092
Heptachlor & H. epoxide (µg/L)	0.0038	0.0025	0.0039	0.26	0.00	0.29
Lindane (µg/L)	0.08	0.05	0.08	1.0	0.1	1.1
Methoxychlor (µg/L)				0.03	0.02	0.03
Mirex (µg/L)				0.001	0.001	0.001
Nonylphenol (µg/L)	6.6	4.4	6.8	28.0	4.4	30.4
Parathion (µg/L)	0.0130	0.0087	0.0135	0.066	0.009	0.072
PCB's (µg/L)	0.014	0.009	0.015			
Pentachlorophenol (µg/L)	15.0	10.1	15.5	19.0	10.1	19.9
Toxephene (µg/L)	0.0002	0.0001	0.0002	0.73	0.00	0.80

1: Background concentration assumed 67% of chronic standard

Radiological

Parameter	Maximum Concentration Standard	Background[1]	Limit
Gross Alpha (pCi/L)	15	10.1	-12.2

1: Background concentration assumed 67% of chronic standard; TDS is based on observed ambient data

Effluent Limitation for Protection of Agriculture (Class 4 Waters)

No dilution in unnamed irrigation ditch.

Parameter	Maximum Concentration Standard	Limit
Total Dissolved Solids (mg/L)	1200	1200
Boron (µg/L)	75	75
Arsenic (µg/L)	100	100
Cadmium (µg/L)	10	10
Chromium (µg/L)	100	100
Copper (µg/L)	200	200
Lead (µg/L)	100	100
Selenium (µg/L)	50	50
Gross Alpha (pCi/L)	15	15

State of Utah
GARY R. HERBERT
Governor

GREG BELL
Lieutenant Governor

Department of
Environmental Quality

Amanda Smith
Executive Director

DIVISION OF WATER QUALITY
Walter L. Baker, P.E.
Director

FEB 0 6 2013

Issa Hamud, P.E.
Environmental Director
Logan City Corporation
450 North 1000 West
Logan City, UT 84321

Dear Mr. Hamud:

Subject: City of Logan Wastewater Treatment Master Plan

The Division of Water Quality (Division) has been working with you and your staff to establish the UPDES discharge permit requirements for Logan's wastewater treatment plant. New permit requirements, specifically for the pollutant ammonia, were anticipated as a result of a recent rule change that affects discharges into Category 3C and 3D waters, including Swift Slough and Cutler Reservoir. The Division has completed its waste load analysis for Logan's discharge as part of the city's permit renewal process and the proposed new effluent limits for ammonia were reported to you under separate cover in a letter from Walt Baker dated January 31, 2013. In summary, the new effluent limits for Logan's discharge will be as follows:

Logan Utah Expected Effluent Limits for Ammonia, mg/L as N

Season:	Winter	Spring	Summer	Fall
Monthly Average	3.0	3.0	1.3	2.6
Daily Maximum	5.0	8.0	6.0	7.0

The Division recognizes that Logan's existing wastewater treatment system will be unable to consistently meet the new ammonia limits without major technology upgrade and capital expenditure. For planning purposes, the new wastewater treatment works must be designed and constructed to be in compliance with the effluent ammonia limits by October 1, 2017, consistent with the compliance date for Logan's total phosphorus discharge.

Logan has submitted a master plan for upgrading its plant; however, the master plan did not address the need for ammonia removal and must be updated. Logan will need to re-evaluate alternatives for upgrading its treatment works in the context of the new ammonia limits. The Division believes that the city will be challenged to consistently meet the ammonia limits for the design waste loadings and the proposed (phased) treatment system alternatives that were presented

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www.deq.utah.gov

in the master plan. In updating the master plan, the alternatives evaluated should all be capable of consistently meeting effluent limits. Seasonal flow balances and pollutant mass balances (including return flows and mass loads) demonstrating permit compliance must be completed for all alternatives analyzed and must be submitted as part of the updated master plan.

For any wastewater treatment alternatives involving continued use of the lagoon system, we believe that it will be critical for Logan to have a good understanding of the hydraulic losses that occur across this system. This understanding will be necessary to accurately demonstrate permit (ammonia) compliance for any alternative that blends treated effluent from the lagoons and a new mechanical treatment plant while minimizing the cost for new treatment works. Because of its importance in the development of a cost effective design, the Division requires that Logan conduct a quantitative analysis of seepage losses through the lagoon liner and that the results of this analysis be used in the flow and pollutant mass balances of its designs.

In the master plan alternatives evaluation, the Division will require that at least one wastewater treatment alternative is developed for the full-flow treatment by a mechanical treatment plant. This is necessary as part of our project funding and "affordability" analysis.

Also as part of the updated master plan, a more thorough assessment of the sewage sludge management approach must be developed. We understand that Logan is planning to dispose sewage sludge from its wastewater treatment operations in the existing sewage lagoons. The Division has a number of concerns about this approach, particularly with respect to the potential accumulation of sludge in the lagoons, the facility's ability to treat and/or remove accumulated sludge, nutrient release, and the potential these conditions have for creating permit exceedences and nuisance conditions. To address these concerns, further analysis is needed.

In the updated master plan, Logan must complete an analysis of the proposed sewage sludge disposal operation. The sewage sludge disposal analysis must identify effective alternatives considered and must establish the expected performance and effectiveness, including costs, of the recommended alternative.

In the sewage sludge disposal analysis the city must demonstrate, e.g., by calculation, that the lagoon system is capable of and has sufficient capacity for effective treatment and disposal of the sewage sludge generated throughout the design period. These calculations must address:

1. Loadings on primary cells;
2. Aeration capacity in the primary cells to satisfy the organic loading, including the sewage sludge loading;
3. The solids distribution, accumulation, and carryover potential in the system;
4. Phosphorus release potential and potential impacts on effluent quality (return flows);
5. Ammonification potential and impacts on effluent quality (return flows);
6. Lagoon liner integrity or equivalent groundwater protection analysis;
7. Sewage sludge disposal contingency plans; and
8. Expected life (duration) of lagoon disposal plan.

As with other facilities in Utah disposing sewage sludge in old lagoons, this disposal method will be considered experimental or an "alternative biological process" that must be terminated and replaced if significant public health, environmental, or nuisance problems develop. Sludge levels in the lagoons will be restricted to two feet of sludge blanket thickness. A biosolids management and contingency plan will be required and this plan will be incorporated into the facility's permit.

Additionally, as with wastewater treatment, the Division will require that at least one sewage sludge management alternative is developed for the design flow condition that incorporates mechanical sludge treatment, e.g., as per U.A.C. R317-3-9, Sludge Processing and Disposal. This is necessary as part of our project funding and affordability analysis.

DWQ requests that you update the project wastewater facilities master plan to reflect the comments in this letter and that you then re-submit the master plan for our review and approval. Please submit two (2) copies of the master plan, sealed by a Utah registered engineer. If you have any questions, please contact me at (801) 536-4347 or by email at jkmackey@utah.gov.

Sincerely,

John K. Mackey

John K. Mackey, P. E.
Engineering Section

JKM:JKM:jkm/fb

cc: C. Ashcroft, P.E. Carollo Engineers, 1265 East Fort Union Blvd., Suite 200, Salt Lake City, UT 84047
L. Shull, DWQ UPDES IES
M. Schmitz, DWQ Biosolids Program

DWQ-2013-001383.DOC
FILE: LOGAN 2013/PLANNING/SECTION 3

GARY R. HERBERT
Governor

GREG BELL
Lieutenant Governor

Julie Fisher
Executive Director
Department of
Heritage & Arts

Utah Division of
State History

Brad Westwood
Director

November 7, 2013

PE

William (Bill) Damery, P.G.
Environmental Scientist
Engineering Section
Division of Water Quality
PO Box 144870
Salt Lake City, Utah 84114-4870

RE: An Archaeological Resource Investigation of the Logan Wastewater Treatment Facility Project, Logan, Cache County, Utah

For future correspondence please reference Case No. 13-1173

Dear Mr. Damery:

The Utah State Historic Preservation Office received your request for our comment on the above referenced undertaking.

We concur with your determinations of eligibility and effect for this undertaking.

Utah Code 9-8-4-4(1)(a) denotes that your agency is responsible for all final decisions regarding cultural resources for this undertaking. Our comments here are provided as specified in U.C.A. 9-8-4-4(3)(a)(i). If you have questions, please contact me at 801-245-7263 or Lori Hunsaker at 801-245-7241 *lhunsaker@utah.gov*.

Sincerely,

Chris Merritt, Ph.D.
Senior Preservation Specialist
comerritt@utah.gov

Document Date 11/12/2013
DWQ-2013-007740 25

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

December 12, 2013

Regulatory Division (SPK-2012-01298-UO)

Mr. Issa A. Hamud
City of Logan
450 North 1000 West
Logan, Utah 84321

Dear Mr. Hamud:

We are responding to your request for a preliminary jurisdictional determination (JD), in accordance with our Regulatory Guidance Letter (RGL) 08-02, for the Logan Wastewater Expansion Area. The approximately 62.9-acre site is located along 200 North in Section 36, Township 12 North, Range 1 West, Salt Lake Meridian, Latitude 41.738°, Longitude -111.890°, Logan City, Cache County, Utah (Enclosure 1).

Based on available information, we concur with the amount and location of wetlands and other water bodies on the site as depicted on the enclosed Logan City Wastewater Treatment Facility, "Wetland and Waters of the U.S. Delineation Maps A1, A2 and B1," prepared by Horrocks Engineering (Enclosure 2-4). The approximately 14.92-acres of wetlands and 4,765-linear feet of ditches/canals present within the survey area are potential waters of the United States regulated under Section 404 of the Clean Water Act.

We have enclosed a copy of the *Preliminary Jurisdictional Determination Form* for this site (Enclosure 5). Please sign and return a copy of the completed form to this office. Once we receive a copy of the form with your signature we can accept and process a Pre-Construction Notification or permit application for your proposed project.

You should not start any work in potentially jurisdictional waters of the United States unless you have Department of the Army permit authorization for the activity. You may request an approved JD for this site at any time prior to starting work within waters. In certain circumstances, as described in RGL 08-02, an approved JD may later be necessary.

You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This preliminary determination has been conducted to identify the potential limits of wetlands and other water bodies which may be subject to Corps of Engineers' jurisdiction for the particular site identified in this request. A combined Notification of Appeal Process Fact Sheet and Request for Appeal form is enclosed to notify you of your options with this determination. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are U.S. Department of Agriculture (USDA) program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

We appreciate your feedback. At your earliest convenience, please tell us how we are doing by completing the customer survey on our website under *Customer Service Survey*.

Please refer to identification number SPK-2012-01298-UO in any correspondence concerning this project. If you have any questions, please contact Hollis Jencks at the Utah Regulatory Office, 533 West 2600 South, Suite 150, Bountiful, Utah 84010, by email at *Hollis.G.Jencks@usace.army.mil*, or telephone at 801-295-8380, extension 18.

Sincerely,

Jason Gipson
Chief, Utah-Nevada Regulatory Office
Sacramento District

Enclosures

cc: (w/o encls)

Mr. Ryan Pitts, Horrocks Engineers, 2162 Grove Parkway, Suite 400, Pleasant Grove, Utah 84062

PRELIMINARY JURISDICTIONAL DETERMINATION FORM
Sacramento District

This preliminary JD finds that there *"may be"* waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

Regulatory Branch: **Nevada-Utah** File/ORM #: **SPK-2012-01298-UO** PJD Date: **December 9, 2013**

State: **UT** City/County: **Logan City, Cache County** Nearest Waterbody: Location (Lat/Long): **41.7382°, -111.890°** Size of Review Area: acres	Name/Address Of Property Owner/ Potential Applicant: **Issa Hamud** **City of Logan** **450 North 1000 West** **Logan, Utah 84321**
Identify (Estimate) Amount of Waters in the Review Area **Non-Wetland Waters:** **4,765** linear feet ft wide **1.65** acre(s) Stream Flow: **Mixed** **Wetlands: 14.92** acre(s) Cowardin Class: **Palustrine, emergent**	Name of any Water Bodies on the site identified as Section 10 Waters: Tidal: Non-Tidal: ☐ Office (Desk) Determination ☒ Field Determination: Date(s) of Site Visit(s): **July 28, 2013**

SUPPORTING DATA: Data reviewed for preliminary JD (check all that apply – checked items should be included in case file and, where checked and requested, appropriately reference sources below)

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: **Horrocks Engineers**
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Data sheets prepared by the Corps.
☐ Corps navigable waters' study.
☒ U.S. Geological Survey Hydrologic Atlas:
  ☐ USGS NHD data.
  ☒ USGS HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name: **1:24K; UT-WELLSVILLE**
☐ USDA Natural Resources Conservation Service Soil Survey.
☐ National wetlands inventory map(s).
☐ State/Local wetland inventory map(s).
☐ FEMA/FIRM maps.
☐ 100-year Floodplain Elevation (if known):
☒ Photographs: ☒ Aerial
  ☐ Other
☐ Previous determination(s). File no. and date of response letter:
☐ Other information (please specify):

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

12/11/13 12/19/13

Please Sign & Date

Signature and Date of Regulatory Project Manager (REQUIRED)

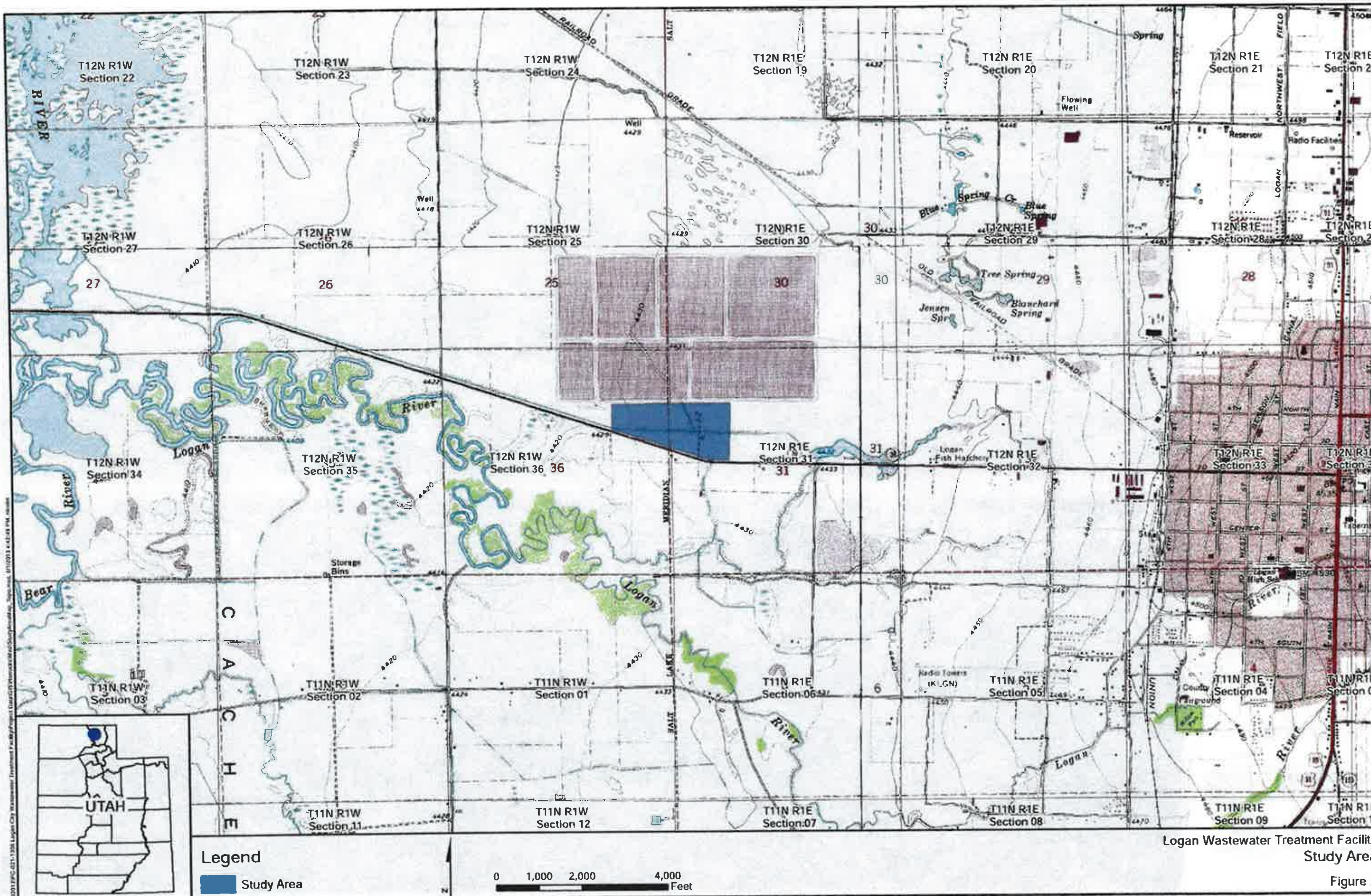
Signature and Date of Person Requesting Preliminary JD (REQUIRED, unless obtaining the signature is impracticable)

EXPLANATION OF PRELIMINARY AND APPROVED JURISDICTIONAL DETERMINATIONS:

1. The Corps of Engineers believes that there may be jurisdictional waters of the United States on the subject site, and the permit applicant or other affected party who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "preconstruction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an approved JD for the activity, the permit applicant is hereby made aware of the following: (1) the permit applicant has elected to seek a permit authorization based on a preliminary JD, which does not make an official determination of jurisdictional waters; (2) that the applicant has the option to request an approved JD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an approved JD could possibly result in less compensatory mitigation being required or different special conditions; (3) that the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) that the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) that undertaking any activity in reliance upon the subject permit authorization without requesting an approved JD constitutes the applicant's acceptance of the use of the preliminary JD, but that either form of JD will be processed as soon as is practicable; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a preliminary JD constitutes agreement that all wetlands and other water bodies on the site affected in any way by that activity are jurisdictional waters of the United States, and precludes any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an approved JD or a preliminary JD, that JD will be processed as soon as is practicable. Further, an approved JD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331, and that in any administrative appeal, jurisdictional issues can be raised (see 33 C.F.R. 331.5(a)(2)). If, during that administrative appeal, it becomes necessary to make an official determination whether CWA jurisdiction exists over a site, or to provide an official delineation of jurisdictional waters on the site, the Corps will provide an approved JD to accomplish that result, as soon as is practicable.

Logan Wastewater Treatment Facility
Study Area
Figure 1



Logan Wastewater Treatment Facility
Study Area
Figure 2

Logan City Wastewater Treatment Facility
Wetland and Waters of the U.S. Delineation
Map A1
Legend
Study Area
Sample Points
Waters of the U.S.
Emergent Wetland (Meadow) PEMA
Emergent Wetland (Marsh) PEME
N
W
E
S
0 50 100 Feet
A1
A2
B1
B2
Wetland 1 0.03-acres
Wetland 2 4.62-acres
Wetland 3 3.25-acres
1
2
3
4

Logan City Regional Wastewater Treatment Facility
U.S. Army Corp of Engineers
Project Introduction Meeting
October 15, 2013

Background

In 2010, the Utah Division of Water Quality (DWQ) identified Cutler Reservoir as being impaired due to low dissolved oxygen concentrations and excess total phosphorus. A total maximum daily load (TMDL) study for Cutler Reservoir resulted in limits to the amount of phosphorus that point and non-point source dischargers might contribute to the system in an effort to protect the beneficial uses of the water body. The Cutler Reservoir TMDL was approved by the EPA and the DWQ has allocated the TMDL to individual point source dischargers, resulting in a limit on the amount of total phosphorus that can be discharged and a compliance schedule for upgrading treatment facilities.

The City of Logan (City) owns and operates a lagoon system that provides wastewater treatment for the City and a number of the surrounding communities. This facility was identified as a point source discharge to Cutler Reservoir, and as such, the City received notification of a new limit on total effluent phosphorus. The lagoon system is not capable of meeting the total phosphorus limit imposed by the TMDL.

DWQ determined that Logan's wastewater discharge permit also needed to be modified to meet a lower ammonia limit. Currently the City has 180 acres of polishing wetlands for ammonia removal after lagoon treatment. However, the polishing wetlands do not provide sufficient ammonia removal to meet the lower limits implemented by the DWQ.

Consequently, the City must build a new treatment system to remove nitrogen and phosphorus to the new environmental standards.

Proposed Treatment System

Since the approval of the TMDL, the City and their engineering consultant Carollo Engineers, have evaluated treatment alternatives that will meet the new discharge requirements in the most reliable and economic means possible. Treatment alternatives considered included a full range of biological and mechanical processes. The recommended alternative is a mechanical treatment process that includes concrete tankage and facilities for pumping, screening, aeration, filtration, and disinfection.

The City was able to purchase property adjacent to the existing lagoon system that will allow this new facility to be constructed while keeping the existing system in operation.

The new facility will require approximately 30 acres of the 63 acre site studied for the wetland delineation. Impacts to wetlands are estimated at 8 acres and impacts to waters of the U.S. are estimated at 0.5 acres as a result of canals that must be relocated. Mitigation options for these impacts are outlined below.

Wetland Mitigation Options

In discussions with the project team, Logan City, and Division of Water Quality (DWQ) staff three possible mitigation options were identified: 1) construct new wetlands adjacent to a previous wetland bank, 2) use existing constructed wetlands, or 3) construct new wetlands in area of existing lagoon cells.

Option 1 – Construct New Wetlands Adjacent to Former Wetland Bank
Logan City maintains a constructed wetland site that was used as a bank for commercial and city projects requiring mitigation. These are deed-restricted wetlands and U.S. Army Corp of Engineers (USACE) local field staff are very familiar with this area. The most recent project was a 10-acre wetland constructed in 2010 (YESCO project). The site is located south of the existing treatment lagoons and Highway 30 (200 North), and west of the existing landfill. Within the property owned by Logan City in this area, there are approximately 30 acres available between the existing constructed wetlands and landfill leachate ponds that are a potential mitigation site (see attached figure). The site is currently dry and has been used as a soil borrow pit for landfill daily cover.

Environmental benefits of a project in this area include additional habitat adjacent to established wetlands and improved water quality of surface runoff that would pass through the wetlands from upland areas north of the site prior to entering the Logan River.

Option 2 – Use Existing Constructed Wetlands
Logan City built nearly 200 acres of wetlands in 2002 as polishing cells to reduce ammonia concentrations in treated effluent below permit limits. Treated effluent is conveyed from the existing lagoons to the polishing cells by open canal and enclosed pipelines and then lifted by Archimedes style screw pumps into storage ponds. Effluent flows by gravity out of the storage ponds into wetland polishing cells that are each 30 acres in size and 10 inches deep. There are a total of six wetland treatment cells and effluent passes through each of these cells in series prior to discharge to Swift Slough and ultimately Cutler Reservoir. The storage ponds hold effluent during the winter months, and release it to the wetlands in summer months as irrigators upstream have priority on treated effluent such that very little reaches the wetlands during this season. Typically, no water flows out of the polishing cells to Swift Slough during the months of July and August, but this varies depending on water year conditions.

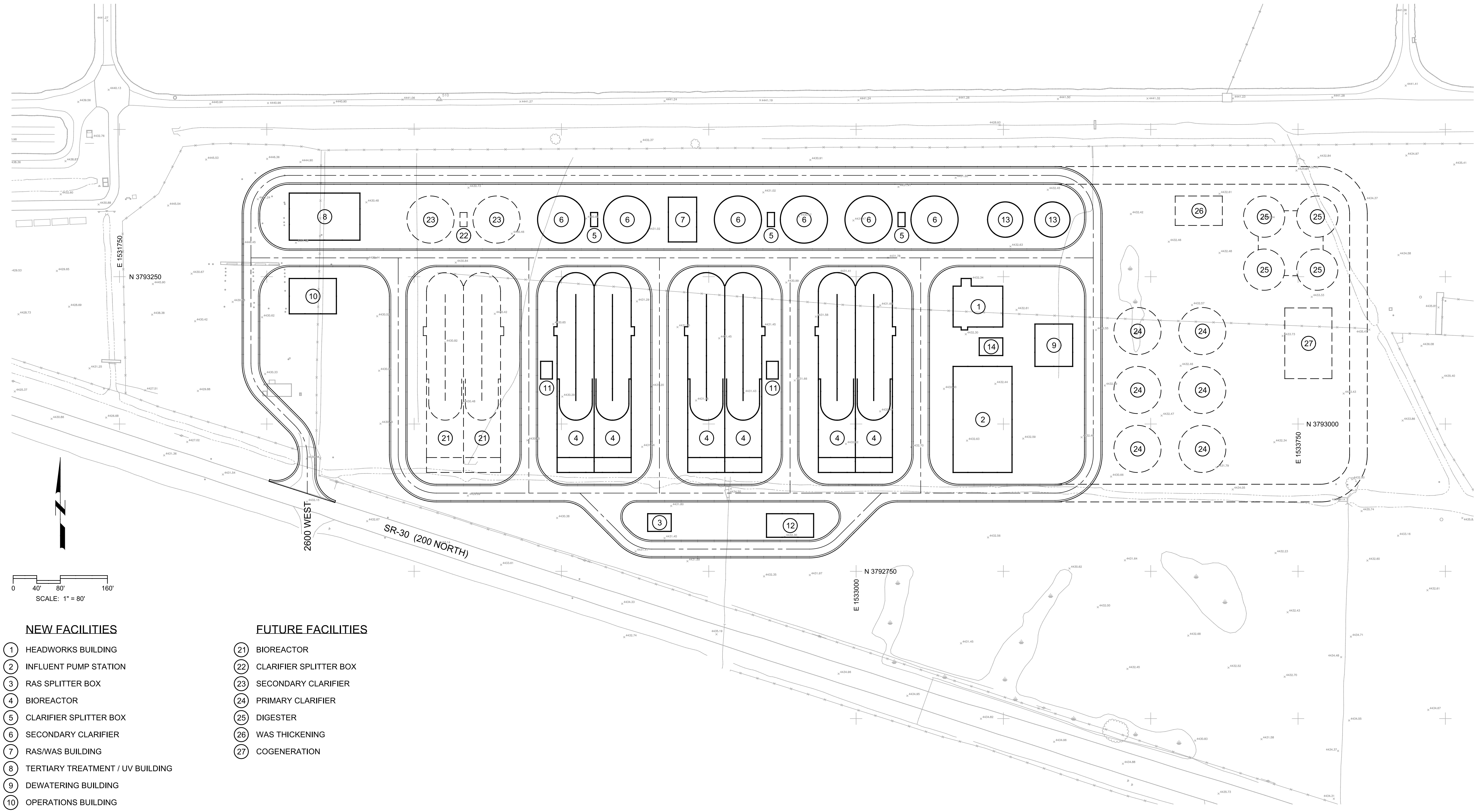
The new mechanical treatment facility will not require polishing cells to meet permit limits for ammonia, and technically, the existing cells could be abandoned. Modifying the existing polishing cells such that USACE would give credit for wetland creation is a possible mitigation strategy for the new treatment facility project. The City received no wetland creation credits from USACE for constructing the polishing cells back in 2002, and in fact had to conduct mitigation efforts for impacts to existing wetlands.

Advantages of this mitigation option include using land that is owned by the city and preserving wetland vegetation that is well established. If wetland creation credits could be secured this may also provide precedent that would allow for a wetland bank for the remaining cells. Although there may be a water quality benefit by flowing treated effluent through Cell 5, the real environmental benefit is keeping this established wetland in existence. This mitigation option could be constructed concurrent with the mechanical treatment plant project.

Option 3 – New Constructed Wetlands in Area of Existing Lagoons
The existing lagoon treatment system consists of seven treatment cells. The new mechanical plant will take the place of these cells, but at least the two primary cells will remain online to help equalize wet weather flows. Existing lagoons cells that are no longer needed for treatment could be converted to constructed wetlands.

The attached figure shows an area currently occupied by Cells D and E of approximately 65 acres. Effluent from the new treatment plant could be diverted into this area and support constructed wetlands prior to conveyance to downstream irrigators. The constructed wetland would be designed to include varying areas of wetland function.

The advantages of this alternative include use of existing city property, its location adjacent to the wastewater treatment facility making it accessible for tours and upkeep, and it eliminates the need to manage downstream irrigation activities. Although there may be a water quality benefit by flowing treated effluent through the wetland, the real benefit would be the creation of new wetland habitat. If wetland creation credits could be secured this may also provide precedent that would allow for a wetland bank for the remaining cells.



NEW FACILITIES

1. HEADWORKS BUILDING
2. INFLUENT PUMP STATION
3. RAS SPLITTER BOX
4. BIOREACTOR
5. CLARIFIER SPLITTER BOX
6. SECONDARY CLARIFIER
7. RAS/WAS BUILDING
8. TERTIARY TREATMENT / UV BUILDING
9. DEWATERING BUILDING
10. OPERATIONS BUILDING
11. ELECTRICAL BUILDING
12. EMERGENCY GENERATOR BUILDING
13. WAS STORAGE TANKS
14. ODOR CONTROL FACILITY

FUTURE FACILITIES

21. BIOREACTOR
22. CLARIFIER SPLITTER BOX
23. SECONDARY CLARIFIER
24. PRIMARY CLARIFIER
25. DIGESTER
26. WAS THICKENING
27. COGENERATION

REV	DATE	BY	DESCRIPTION

DESIGNED
DRAWN
CHECKED
DATE ______ 2013
PROJECT ENGINEER
PROJECT MANAGER

carollo®

LOGAN CITY UNITED IN SERVICE

CITY OF LOGAN
WASTEWATER TREATMENT PLANT IMPROVEMENTS PROJECT
CIVIL
FACILITY INDEX
MAIN PLANT SITE PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621A.10
DRAWING NO. C-02
SHEET NO. OF XXX

Plot Date: 04-SEP-2013 9:38:44 AM User: TDonnell PlotScale: 2:1 DesignScript: Carollo_Std_Pen_v0905.pen ColorTable: gshade.ctb Model: Layout1 LAST SAVED BY: tdonnell

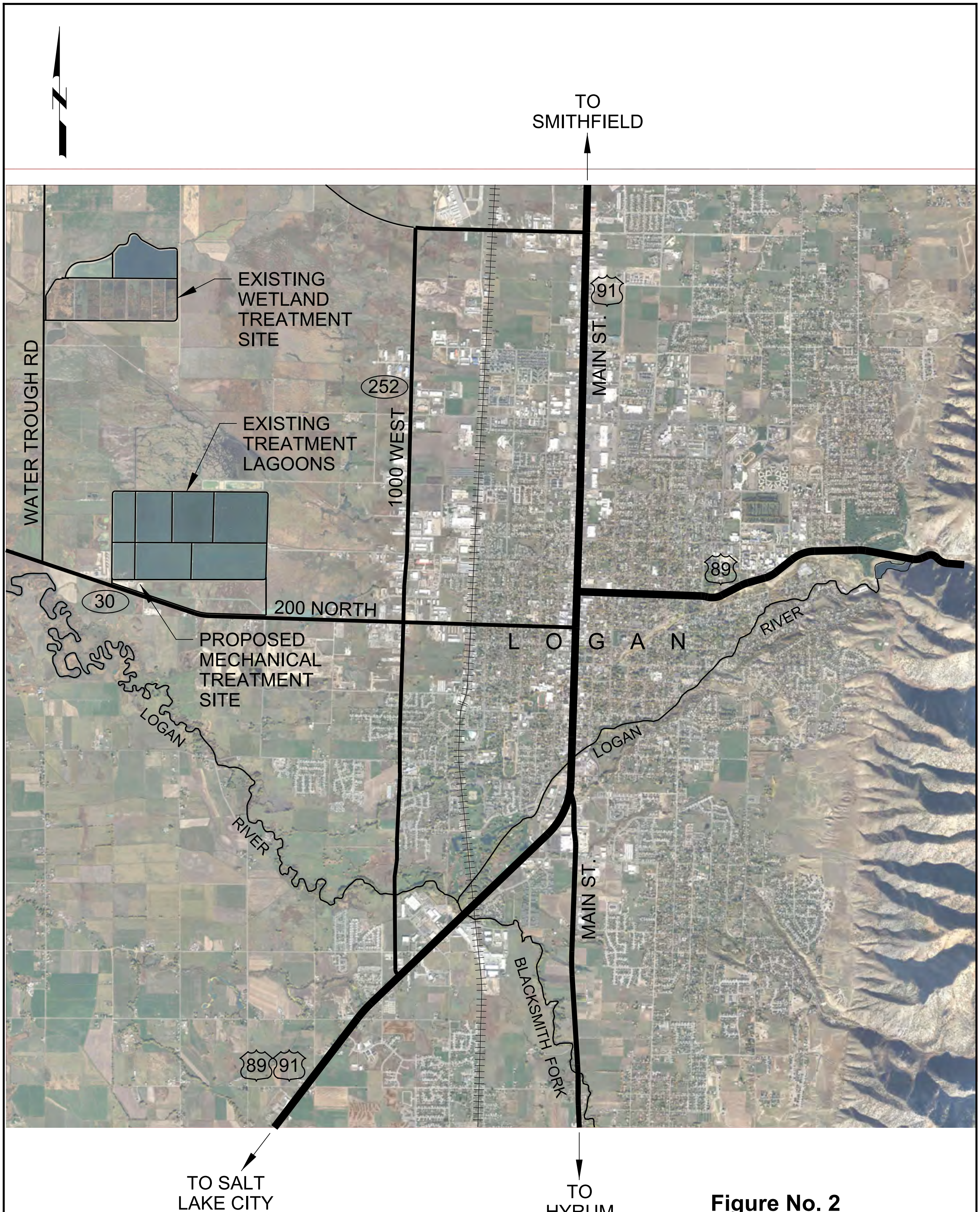
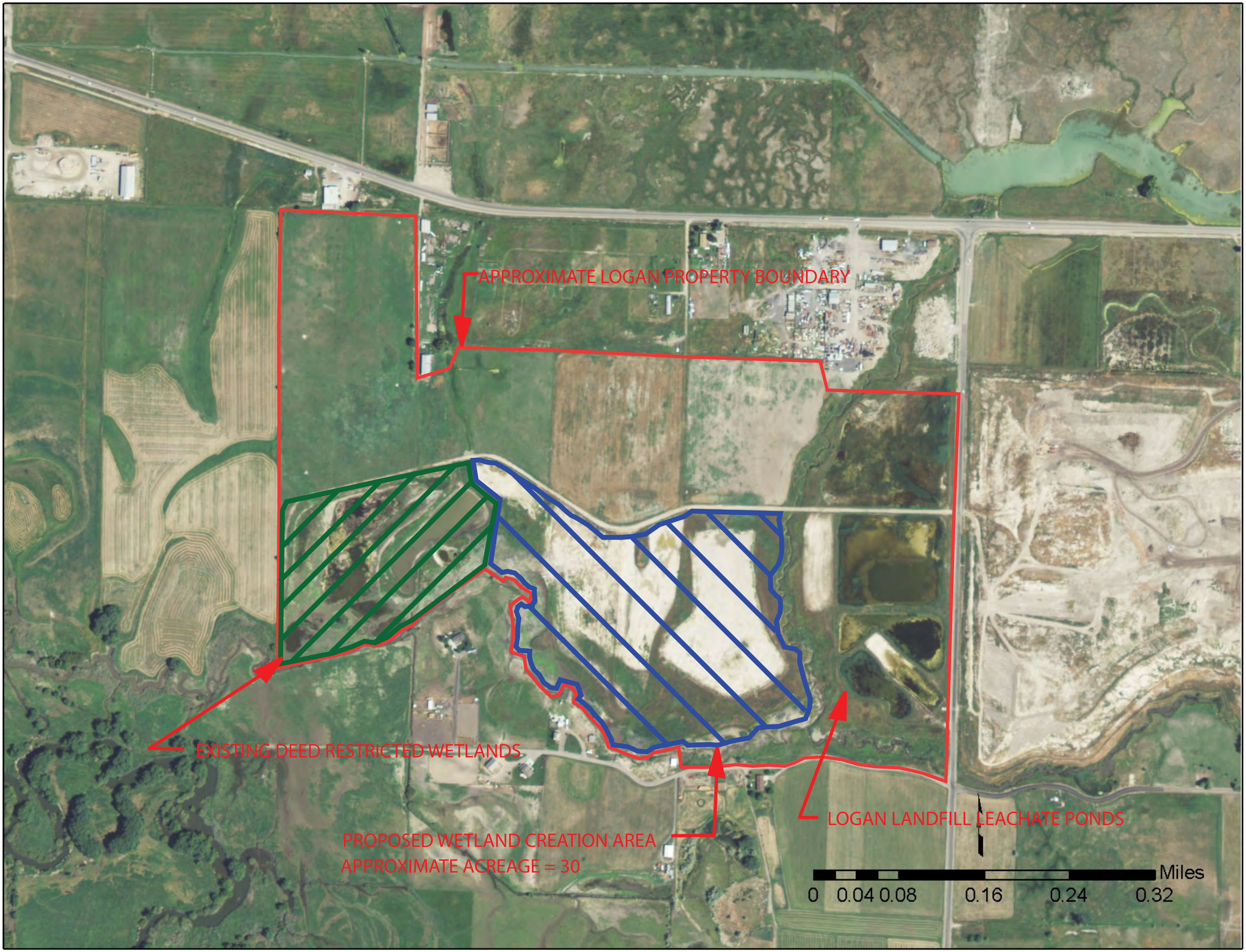


Figure No. 2
VICINITY MAP
CITY OF LOGAN

DISCHARGE TO SWIFT SLOUGH
CONVERT CELL 5 TO NATURAL WETLAND
APROXIMATE ACREAGE = 36
NEW DEDICATED GRAVITY LINE
Miles
0 0.05 0.1 0.2 0.3 0.4


APPROXIMATE LOGAN PROPERTY BOUNDARY
EXISTING DEED RESTRICTED WETLANDS
LOGAN LANDFILL LEACHATE PONDS
PROPOSED WETLAND CREATION AREA
APPROXIMATE ACREAGE = 30
0 0.04 0.08 0.16 0.24 0.32
Miles


DISCHARGE TO CUTLER RESERVOIR VIA BLUE SPRING
CONVERT CELLS TO NATURAL WETLAND
APROXIMATE ACREAGE = 65
PROPOSED SITE PLAN OF NEW FACILITY
Miles
0
0.05
0.1
0.2
0.3
0.4

February 14, 2014

RECEIVED FEB 18 2014 MU Utah Division of Water Quality

Walt Baker, Director
Department of Environmental Quality
Division of Water Quality
P.O. Box 144870
Salt Lake City, Utah 84114-4870

Dear Mr. Baker:

In Cache County, 75% of all residents have their sewage treated at the Logan lagoons. These residents are represented in seven cities located in the heart of Cache County including Nibley, Providence, River Heights, Logan, North Logan, Hyde Park, and Smithfield. Of these seven cities, six currently contract with Logan for this service and they represent 43.4% of all residents who rely on the lagoons for their sewage treatment

With the new discharge standards for nitrogen, phosphorous, and ammonia being established by the EPA, it appears likely that the lagoon system will no longer be able to meet the standards thereby requiring the abandonment of the current lagoon system resulting in the need for an alternative method of treatment. It has consistently been the opinion of the six contracting cities that a regional plant is a far better option than having multiple treatment plants scattered throughout the valley serving individual or smaller groups of cities. The benefits to the Division of Water Quality with respect to their role as overseers of a single or regional plant in contrast to multiple plants, has also been well established. In addition, sewer districts with their associated regional plants that have been constructed up and down the Wasatch Front such as South Davis, South Valley, Central Davis have validated the efficiency and effectiveness of sewer districts and regional plants in meeting the treatment needs of cities.

In 2012 when it became apparent the lagoons may fall short of meeting the new discharge standards, commitments were made by Logan City representatives to involve the contracting cities in charting a future path for sewage treatment for the area currently being served by the lagoons. Yet we were kept in the dark, only learning of the completed facility plan study through newspaper articles. Despite a commitment by Logan City officials and staff to consider the formation of a sewer district should Logan City have to abandon their lagoon system in favor of a new mechanical plant, Logan City has recently refused to consider that as a possibility. Despite concerns relative to rates and overhead fees and how those funds are being used, the contracting cities have been denied a voice in determining the overall financial plans for the sewer treatment system.

We recognize as contracting cities under the current system that we are subject to the terms and conditions established by Logan City. It has been their lagoon system and even though our rates have helped pay for many of the improvements over the years, they have been the service provider and the facility owner. As cities, we have acknowledged and accepted this fact. However, with the inevitable abandonment of the Logan lagoon system, we as a united community of mayors representing the contract cities have encouraged the pursuit of a sewer district only to be rebuffed by officials and staff of Logan City.

Failure to consider a sewer district as a means to govern and manage sewage treatment, leaves the six contracting cities with only a "take it or leave it" option. If the Water Quality Board were to fund the new treatment facility on behalf of only Logan City, 45% of the users would be forced to either contract with Logan City without meaningful representation or seek funding to build and operate their own facilities. A meeting recently scheduled between the contracting cities and Logan City to simply discuss the feasibility of a sewer district and to better understand the process that would be required to establish a sewer district was promptly cancelled by Logan City staff upon hearing three of the contracting cities (North Logan, Smithfield, and Hyde Park) were exploring the *possibility* of a separate sewage treatment facility should such a facility become necessary.

Of the six contracting cities, three are located south of Logan and three are located to the north. As a result, each city has invested heavily in the construction of outfall lines, pump stations, and metering stations to transport their sewage to the centrally located sewage lagoons and the proposed site of the new Logan treatment plant. Building individual treatment plants, although an option worth consideration, would result in the abandonment of all or a portion of this infrastructure. In addition, due to the fact Logan geographically separates the six cities into two groups, one north and one south, at least two additional regional plants would need to be funded and built.

As mayors representing six of the seven cities currently using the Logan sewer lagoons, we find ourselves at a crossroads. No one city, including Logan, has a treatment facility capable of meeting the new discharge standards. As a result, we must all start anew. To provide seventy-million dollars ($70,000,000) to one city thereby allowing that one city to build the treatment facility and then dictate ongoing terms to the other six cities would be an injustice. Growth patterns in Cache Valley indicate that soon the population of the six cities will exceed that of Logan City due to the limited amount of land available for growth within Logan City compared to that of the contracting cities. As a result, inevitable future expansion of the new mechanical plant will be required because of non-Logan growth. There is now an opportunity at hand whereby every resident and business may have equal representation and a voice while achieving the goal of constructing one regional sewage treatment facility for all. It speaks to the need for efficiency, reliability, oversight, and economic responsibility.

As representatives of nearly half of all users of the current lagoon system we are united in the belief that a single regional facility has merit and would provide the most beneficial option for sewage treatment for all cities, including Logan City. It remains our desire to pursue the advantages of a sewer district because to do otherwise would be to deny proper representation of all residential and commercial users. We therefore respectfully request the Water Quality Board delay final approval of the funding for a new sewage treatment facility for Logan City, or tie such funding to the formation of a sewer district that will represent all users.

Sincerely,

Lloyd Berentzen
Mayor, North Logan City

Bryan Cox
Mayor, Hyde Park City

Darrell G. Simmons
Mayor, Smithfield

James Brackner
Mayor, River Heights City

Don W. Calderwood
Mayor, Providence City

Shaun Dustin
Mayor, Nibley City

United States Department of Agriculture

Natural Resources
Conservation Service

Utah State Office

125 So. State Street
Room 4010
Salt Lake City, UT
84138-1100

Voice: 801-524-4550
Fax: 801-524-4403

June 25, 2014

Judy Imlay, Esq. Environmental Analyst
Horrocks Engineers
2162 W. Grove Parkway, Suite 400
Pleasant Grove, Utah 84062

Regarding: Logan Waste Water Treatment Expansion

Dear Ms. Imlay:

The proposed Logan Waste Water Treatment Expansion will impact Statewide Important Farmland. The Farmland Conversion Impact Rating form (AD-1006) is attached.

Also included is the WEB Soil Survey report that was used for the analysis. The area-of-interest was based on the location map you provided. Please review the WEB Soil Survey report and insure that the area-of-interest used is correct.

According to the Farmland Protection Policy Act, it is the responsibility of the Federal agency that is funding a project to report the number of acres of farmland actually converted. At the end of the fiscal year, NRCS compiles a report on the acres of farmland proposed for conversion and the acres actually converted. At your convenience please provide us the number of acres actually converted for this project.

I hope you find this information helpful. Please call (801.524.4574) or email (mike.domeier@ut.usda.gov) with any further questions.

Sincerely,

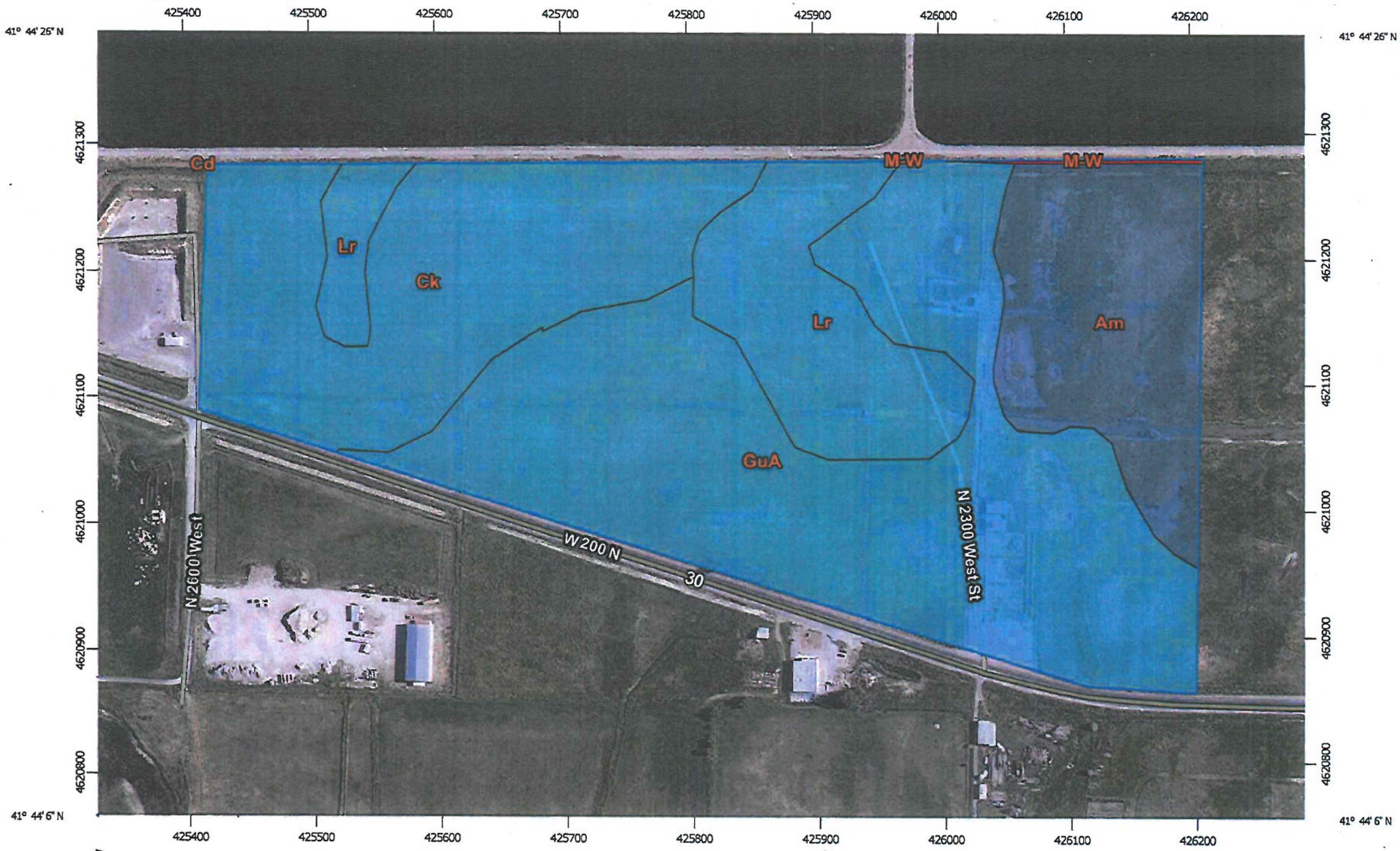
Mike Domeier

MIKE DOMEIER

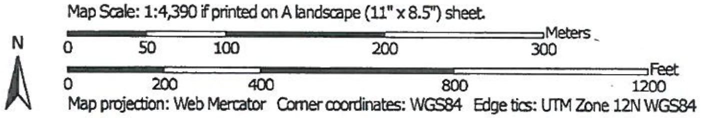
State Soil Scientist

Enclosure:

Map—Farmland Classification (Area of Interest - Logan Waste Water Treatment)



Map Scale: 1:4,390 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

Table—Farmland Classification (Area of Interest - Logan Waste Water Treatment)

Farmland Classification— Summary by Map Unit — Cache Valley Area, Parts of Cache and Box Elder Counties, Utah (UT603)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
Am	AIRPORT-SALT LAKE COMPLEX	Farmland of local importance	9.7	15.4%
Cd	CARDON SILTY CLAY	Farmland of statewide importance	0.0	0.0%
Ck	COLLETT SILTY CLAY LOAM	Farmland of statewide importance	15.8	25.2%
GuA	GREENSON LOAM, DEEP OVER CLAY, 0 TO 1 PERCENT SLOPES	Farmland of statewide importance	28.2	44.9%
Lr	LOGAN SILTY CLAY LOAM	Farmland of statewide importance	8.9	14.2%
M-W	MISCELLANEOUS WATER	Not prime farmland	0.2	0.3%
Totals for Area of Interest			**62.8**	**100.0%**

Rating Options—Farmland Classification (Area of Interest - Logan Waste Water Treatment)

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 6/20/14		
Name of Project Logan Wastewater Treatment Expansion	Federal Agency Involved		
Proposed Land Use Wastewater Treatment Facility	County and State Cache, UT		
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 6/20/14	Person Completing Form: Mike Domeier	
Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☑ NO ☐	Acres Irrigated 83,945	Average Farm Size 207
Major Crop(s) Alfalfa, Corn Silage, Wheat	Farmable Land In Govt. Jurisdiction Acres: 23 % 173,694	Amount of Farmland As Defined in FPPA Acres: 18 % 135,866	
Name of Land Evaluation System Used Cache County LE	Name of State or Local Site Assessment System Cache LESA Handbook - Oct 2004	Date Land Evaluation Returned by NRCS 6/25/14	

PART III *(To be completed by Federal Agency)*		Alternative Site Rating Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly		62			
B. Total Acres To Be Converted Indirectly		0			
C. Total Acres In Site		62			
PART IV *(To be completed by NRCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland		0			
B. Total Acres Statewide Important or Local Important Farmland		62			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted		.0004			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value		70			
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)		75			
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	**Maximum Points**	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)				
2. Perimeter In Non-urban Use	(10)				
3. Percent Of Site Being Farmed	(20)				
4. Protection Provided By State and Local Government	(20)				
5. Distance From Urban Built-up Area	(15)				
6. Distance To Urban Support Services	(15)				
7. Size Of Present Farm Unit Compared To Average	(10)				
8. Creation Of Non-farmable Farmland	(10)				
9. Availability Of Farm Support Services	(5)				
10. On-Farm Investments	(20)				
11. Effects Of Conversion On Farm Support Services	(10)				
12. Compatibility With Existing Agricultural Use	(10)				
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	75	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	0	0	0	0
TOTAL POINTS ***(Total of above 2 lines)***	260	75	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form:	Date:

(See Instructions on reverse side)

Form AD-1006 (03-02)

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 - Federal agencies (or Federally funded projects) involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form. For Corridor type projects, the Federal agency shall use form NRCS-CPA-106 in place of form AD-1006. The Land Evaluation and Site Assessment (LESA) process may also be accessed by visiting the FPPA website, http://fppa.nrcs.usda.gov/lesa/.

Step 2 - Originator (Federal Agency) will send one original copy of the form together with appropriate scaled maps indicating location(s)of project site(s), to the Natural Resources Conservation Service (NRCS) local Field Office or USDA Service Center and retain a copy for their files. (NRCS has offices in most counties in the U.S. The USDA Office Information Locator may be found at http://offices.usda.gov/scripts/ndISAPI.dll/oip_public/USA_map, or the offices can usually be found in the Phone Book under U.S. Government, Department of Agriculture. A list of field offices is available from the NRCS State Conservationist and State Office in each State.)

Step 3 - NRCS will, within 10 working days after receipt of the completed form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland. (When a site visit or land evaluation system design is needed, NRCS will respond within 30 working days.

Step 4 - For sites where farmland covered by the FPPA will be converted by the proposed project, NRCS will complete Parts II, IV and V of the form.

Step 5 - NRCS will return the original copy of the form to the Federal agency involved in the project, and retain a file copy for NRCS records.

Step 6 - The Federal agency involved in the proposed project will complete Parts VI and VII of the form and return the form with the final selected site to the servicing NRCS office.

Step 7 - The Federal agency providing financial or technical assistance to the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

(For Federal Agency)

Part I: When completing the "County and State" questions, list all the local governments that are responsible for local land use controls where site(s) are to be evaluated.

Part III: When completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them or other major change in the ability to use the land for agriculture.
2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities planned build out capacity) that will cause a direct conversion.

Part VI: Do not complete Part VI using the standard format if a State or Local site assessment is used. With local and NRCS assistance, use the local Land Evaluation and Site Assessment (LESA).

1. Assign the maximum points for each site assessment criterion as shown in § 658.5(b) of CFR. In cases of corridor-type project such as transportation, power line and flood control, criteria #5 and #6 will not apply and will, be weighted zero, however, criterion #8 will be weighed a maximum of 25 points and criterion #11 a maximum of 25 points.

2. Federal agencies may assign relative weights among the 12 site assessment criteria other than those shown on the FPPA rule after submitting individual agency FPPA policy for review and comment to NRCS. In all cases where other weights are assigned, relative adjustments must be made to maintain the maximum total points at 160. For project sites where the total points equal or exceed 160, consider alternative actions, as appropriate, that could reduce adverse impacts (e.g. Alternative Sites, Modifications or Mitigation).

Part VII: In computing the "Total Site Assessment Points" where a State or local site assessment is used and the total maximum number of points is other than 160, convert the site assessment points to a base of 160.
Example: if the Site Assessment maximum is 200 points, and the alternative Site "A" is rated 180 points:

$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \text{ X } 160 = 144 \text{ points for Site A}$$

For assistance in completing this form or FPPA process, contact the local NRCS Field Office or USDA Service Center.

NRCS employees, consult the FPPA Manual and/or policy for additional instructions to complete the AD-1006 form.

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 21 Aug 15
Name of Project Logan Wastewater Treatment EA	Federal Agency Involved
Proposed Land Use Water Treatment Plant	County and State Cache County, Utah
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 25 Aug 15 / Person Completing Form: Domeier

Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☑	NO ☐	Acres Irrigated 83945	Average Farm Size 207
Major Crop(s) Alfalfa	Farmable Land In Govt. Jurisdiction Acres: 173694 % 23		Amount of Farmland As Defined in FPPA Acres: 13586 % 18	
Name of Land Evaluation System Used	Name of State or Local Site Assessment System		Date Land Evaluation Returned by NRCS 31 Aug 15	

PART III *(To be completed by Federal Agency)*		Alternative Site Rating			
		Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly		32			
B. Total Acres To Be Converted Indirectly		22.2			
C. Total Acres In Site		54.2			
PART IV *(To be completed by NRCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland					
B. Total Acres Statewide Important or Local Important Farmland		49			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted		.0004			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value		70			
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)		75			
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	**Maximum Points**	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)	15			
2. Perimeter In Non-urban Use	(10)	10			
3. Percent Of Site Being Farmed	(20)	0			
4. Protection Provided By State and Local Government	(20)	20			
5. Distance From Urban Built-up Area	(15)	11			
6. Distance To Urban Support Services	(15)	0			
7. Size Of Present Farm Unit Compared To Average	(10)	0			
8. Creation Of Non-farmable Farmland	(10)	10			
9. Availability Of Farm Support Services	(5)	4			
10. On-Farm Investments	(20)	1			
11. Effects Of Conversion On Farm Support Services	(10)	0			
12. Compatibility With Existing Agricultural Use	(10)	0			
TOTAL SITE ASSESSMENT POINTS	160	71	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	75	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	71	0	0	0
TOTAL POINTS ***(Total of above 2 lines)***	260	146	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☑

Reason For Selection:

Name of Federal agency representative completing this form:	Date:

(See Instructions on reverse side) **Form AD-1006 (03-02)**

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 - Federal agencies (or Federally funded projects) involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form. For Corridor type projects, the Federal agency shall use form NRCS-CPA-106 in place of form AD-1006. The Land Evaluation and Site Assessment (LESA) process may also be accessed by visiting the FPPA website, http://fppa.nrcs.usda.gov/lesa/.

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Step 6 - The Federal agency involved in the proposed project will complete Parts VI and VII of the form and return the form with the final selected site to the servicing NRCS office.

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(For Federal Agency)

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Part VI: Do not complete Part VI using the standard format if a State or Local site assessment is used. With local and NRCS assistance, use the local Land Evaluation and Site Assessment (LESA).

1. Assign the maximum points for each site assessment criterion as shown in § 658.5(b) of CFR. In cases of corridor-type project such as transportation, power line and flood control, criteria #5 and #6 will not apply and will, be weighted zero, however, criterion #8 will be weighed a maximum of 25 points and criterion #11 a maximum of 25 points.

2. Federal agencies may assign relative weights among the 12 site assessment criteria other than those shown on the FPPA rule after submitting individual agency FPPA policy for review and comment to NRCS. In all cases where other weights are assigned, relative adjustments must be made to maintain the maximum total points at 160. For project sites where the total points equal or exceed 160, consider alternative actions, as appropriate, that could reduce adverse impacts (e.g. Alternative Sites, Modifications or Mitigation).

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Example: if the Site Assessment maximum is 200 points, and the alternative Site "A" is rated 180 points:

$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \times 160 = 144 \text{ points for Site A}$$

For assistance in completing this form or FPPA process, contact the local NRCS Field Office or USDA Service Center.

NRCS employees, consult the FPPA Manual and/or policy for additional instructions to complete the AD-1006 form.

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In state toll free: 800.662.1644

July 11, 2014

Submitted via email to Larry_Crist@fws.gov

US Fish and Wildlife Service
Mr. Larry Crist
Utah Field Supervisor
2369 West Orton Circle, Suite 50
West Valley City, Utah 84119

Re: Logan Waste Water Treatment Facilities

Dear Mr. Crist,

Logan City owns and operates a lagoon wastewater treatment facility to filter and clean approximately 15 million gallons of wastewater each day. The facility currently treats wastewater from Logan, Nibley, Providence, River Heights, North Logan, and Smithfield. The lagoons operate as a passive system that filters out solid wastes and harmful chemicals before discharging the effluent for irrigation use.

The Environmental Protection Agency (EPA) recently released new standards that must be met by 2020 for the levels of phosphorus and ammonia that can be released in the filtered/cleaned water. The current lagoon wastewater treatment facility cannot achieve the new EPA standards. Therefore, Logan City is planning to construct a mechanical wastewater treatment facility to reduce phosphorus and ammonia to acceptable levels.

The proposed action would construct a three-stage Bardenpho bio-reactor mechanical treatment facility. This alternative was identified as most practicable and cost effective treatment process for phosphorus and ammonia over a 20-year life cycle. Construction methods for the facility include pre-loading the site with imported fill material, excavation, grading, utility installation, and facility construction. Please see the attached project location map.

On behalf of the Utah Division of Water Quality, an Environmental Assessment is being prepared to analyze the potential impacts of the proposed project on environmental resources, in accordance with the National Environmental Policy Act (NEPA). As part of that effort, a survey of the project area was conducted by Horrocks Engineers to review the project area for the presence/absence of federally-listed ESA species, as well as critical habitat for said species. The survey was conducted on July 18, 2013 and data regarding exact species localities of federally-listed ESA species known to occur within and adjacent to the project area were obtained from the Utah Natural Heritage Program's (UNHP) database.

Enclosed please find the *Logan City Wastewater Treatment Facility Threatened & Endangered Species Effects Determination Report, Cache County, Utah*, which was prepared in connection with the proposed project. The report makes the following conclusions as to the potential impact of the proposed project on federally-listed species (see Table 1 below):

Table 1: Effect Determinations for Threatened and Endangered Species in Cache County, Utah

Common Name	Scientific Name	Status	Determinations
Plants			
Maguire Primrose	*Primula maguirei*	Threatened	No effect
Ute Ladies' Tresses	*Spiranthes diluvialis*	Threatened	May affect, not likely to adversely affect
Mammals			
Canada Lynx	*Lynx canadensis*	Threatened	No effect
Birds			
Greater Sage-grouse	*Centrocercus urophasianus*	Candidate	No effect
Yellow-billed Cuckoo	*Coccyzus americanus*	Candidate	No effect
Fish			
Least Chub	*Iotichthys phlegethontis*	Candidate	No effect

The purpose of this letter is to request USFWS concurrence on the determinations associated with the proposed project. Please review the attached report and advise as to whether USFWS concurs with the above determinations.

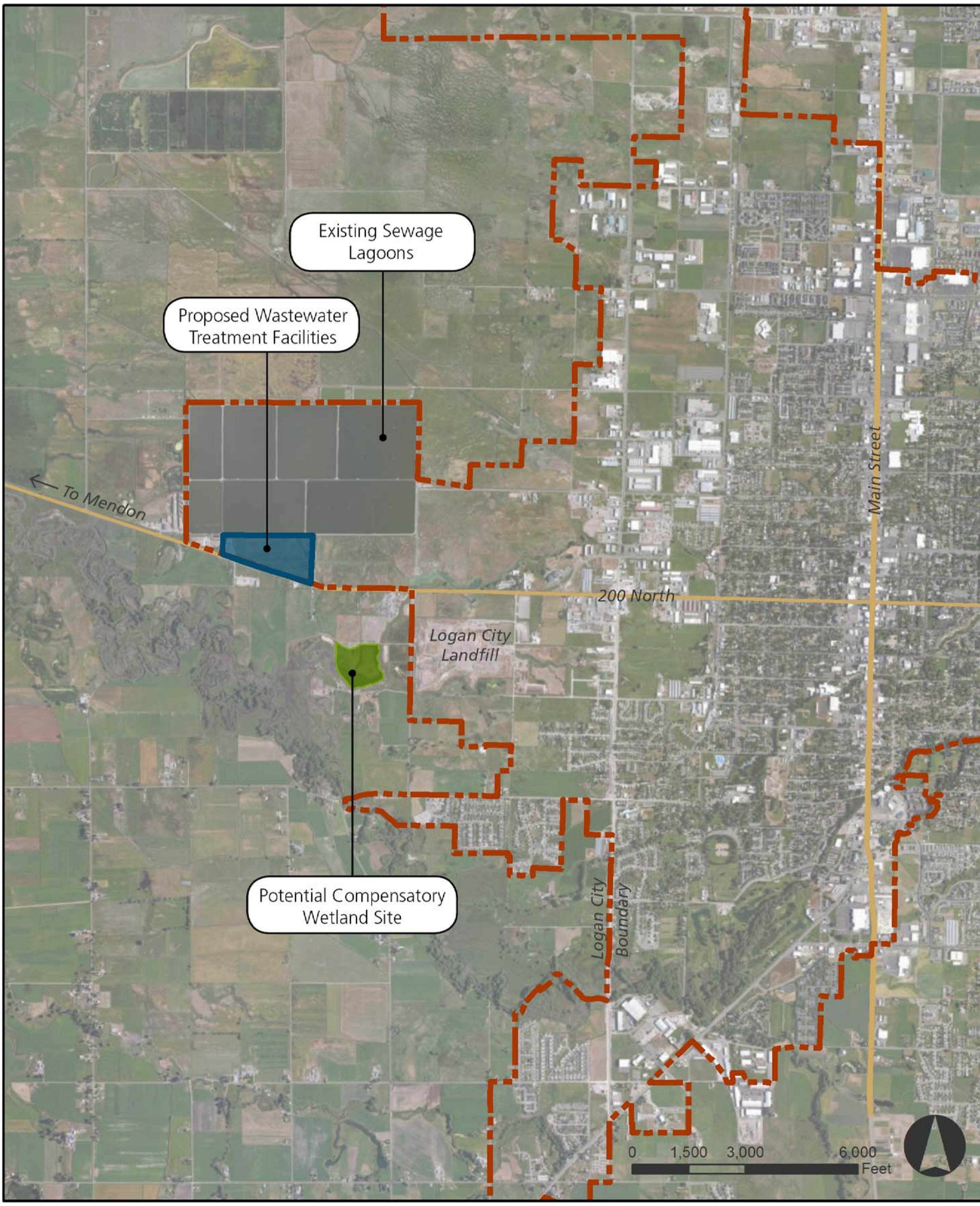
Thank you for your assistance with this matter. If you have questions or concerns, please contact me at 801-763-5173 or judyi@horrocks.com.

Sincerely,
HORROCKS ENGINEERS

Judy Imlay

Encl. Project Location Map
Logan City Wastewater Treatment Facility Threatened & Endangered Species Effects Determination Report, Cache County, Utah

cc: William Damery – Utah Division of Water Quality
Clinton Rogers – Carollo Engineers



Existing Sewage Lagoons
Proposed Wastewater Treatment Facilities
To Mendon
200 North
Main Street
Logan City Landfill
Potential Compensatory Wetland Site
Logan City Boundary
0
1,500
3,000
6,000
Feet

Logan City
Wastewater Treatment Facility
Threatened & Endangered Species
Effects Determination Report
Cache County, Utah

Prepared by:

Horrocks Engineers
2162 West Grove Parkway, Suite 400
Pleasant Grove, Utah
Contact: Ryan Pitts

August 2013

Introduction

Logan City owns and operates a lagoon wastewater treatment facility to filter and clean approximately 15 million gallons of wastewater each day. The facility currently treats wastewater from Logan, Nibley, Providence, River Heights, North Logan, and Smithfield. The lagoons operate as a passive system that filters out solid wastes and harmful chemicals before discharging the effluent for irrigation use.

The Environmental Protection Agency (EPA) recently released new standards that must be met by 2020 for the levels of phosphorus and ammonia that can be released in the filtered/cleaned water. The current lagoon wastewater treatment facility cannot achieve the new EPA standards. Therefore, Logan City is planning to construct a mechanical wastewater treatment facility to reduce phosphorus and ammonia to acceptable levels.

The purpose of this report is to make an effects determination on whether the proposed project would impact federally-listed species in accordance with the Endangered Species Act (ESA) of 1973 (7 U.S.C. 136, 16 U.S.C. 1531 et seq.), as amended.

Proposed Action

The proposed action would construct a three-stage Bardenpho bio-reactor mechanical treatment facility. This alternative was identified as most practicable and cost effective treatment process for phosphorus and ammonia over a 20-year life cycle.

Construction methods for the facility include pre-loading the site with imported fill material, excavation, grading, utility installation, and facility construction.

Project Area

The project area is approximately 63 acres, bounded by the Logan Wastewater Treatment Facility on the north, 200 North on the south, 2200 West on the east, and 2600 West on the west. At this time it is estimated that only about 30 acres of the site would be disturbed by either re-grading or construction. The remaining land would remain undisturbed.

Species

Table 1 contains federally-listed ESA species that are known to occur in Cache County, Utah and are considered in this effects determination. This list was last updated April 2, 2013 (USFWS 2013a). No ESA designated critical habitat occurs within the project area (USFWS 2013b).

Table 1. Threatened, Endangered, and Candidate Species Protected Under the ESA

Common Name	Scientific Name	Status
Plants		
Maguire Primrose	*Primula maguirei*	Threatened

Common Name	Scientific Name	Status
Ute Ladies' Tresses	*Spiranthes diluvialis*	Threatened
Mammals		
Canada Lynx	*Lynx canadensis*	Threatened
Birds		
Greater Sage-grouse	*Centrocercus urophasianus*	Candidate
Yellow-billed Cuckoo	*Coccyzus americanus*	Candidate
Fish		
Least Chub	*Iotichthys phlegethontis*	Candidate

Source: U.S. Fish and Wildlife Service - last updated April 2, 2013 (USFWS 2013a)

The following species accounts and descriptions are from the Utah Conservation Data Center, a part of the Utah Division of Wildlife Resources (UDWR 2013).

Maguire Primrose

Maguire primrose, *Primula maguirei*, is a federally listed threatened plant that is a narrow endemic to (it occurs only in) Logan Canyon, Cache County, Utah. A member of the primula family, this species is a perennial herb with broad, spatula-shaped leaves. Stems are approximately four to fifteen cm tall, with each bearing one to three showy rose to lavender-colored flowers that bloom in late April and May. Maguire primrose is found on either north-facing or well shaded south-facing moss covered sites on damp ledges, in crevices, and on over-hanging rocks along the walls near the bottom of the canyon. It grows at elevations ranging from 1550 to 2012 meters. The habitat of Maguire primrose is subject to impacts resulting from highway improvements, recreational rock climbing and hiking, and water development activities.

Ute Ladies' Tresses

Ute ladies'-tresses, *Spiranthes diluvialis*, is a Federally listed threatened plant that occurs in Cache, Daggett, Duchesne, Garfield, Juab/Tooele, Uintah, Utah, Wasatch and Wayne counties, Utah, and is known historically from Salt Lake and Weber counties. It also occurs in the states of Colorado, Idaho, Montana, Nebraska, Nevada, Washington, and Wyoming and in the Canadian province of British Columbia. A member of the orchid family, this species is a perennial herb with a flowering stem, 20-50 cm tall that arises from a basal rosette of grass-like leaves. The flowers are ivory-colored, arranged in a spike at the top of the stem, and bloom mainly from late July through August. Ute ladies'-tresses is found in moist to very wet meadows, along streams, in abandoned stream meanders, and near springs, seeps, and lake shores. It grows in sandy or loamy soils that are typically mixed with gravels. In Utah, it ranges in elevation from 1311 to 2134 meters. The riparian habitats in which this species occurs have been drastically modified by urbanization and stream channelization for agriculture and development. Most surviving populations are small and appear to be relict in nature.

Canada Lynx

The Canada lynx, *Lynx canadensis*, is a medium-sized cat that is listed as a sensitive species by the Utah Division of Wildlife Resources, and as a threatened species by the U.S. Fish and Wildlife Service. The range of *Lynx canadensis* extends from Canada and Alaska south to Maine, the Rocky Mountains, and the Great Lakes region. Although sightings of the Canada lynx in Utah over the past twenty years are exceedingly rare, the U.S.D.A. Forest Service recently announced that Canada lynx hair was found in the Mani-La Sal National Forest during 2002.

The preferred habitat of the Canada lynx is montane coniferous forest. Alteration of this habitat, through logging, clearing, and road construction, represents the largest current threat to Canada lynx populations. The Canada lynx is nocturnal and its major food source is the snowshoe hare, *Lepus americanus*. The Canada lynx breeds from late winter to early spring, with an average litter size of three or four.

Greater Sage-grouse

The Greater Sage-Grouse, *Centrocercus urophasianus*, is also known as the Sage-Hen and the Sage-Chicken. The largest of the North American grouse, the male is 25 to 30 inches in length and may weigh up to seven pounds. The female is smaller, averaging 20 inches in length and slightly less than three pounds. It is a grayish-brown bird with a dark belly, and long and pointed tail feathers. The feet are feathered to the toes. The throat of the male is black, bordered with white at the rear. Yellow air sacs, covered with short, stiff, scale-like white feathers, are found on each side of the neck. The female has the same general appearance but lacks the air sacs and has a white throat.

These birds inhabit sagebrush plains, foothills, and mountain valleys. Sagebrush is the predominant plant of quality habitat. Where there is no sagebrush, there are no Sage-Grouse. A good understory of grasses and forbs, and associated wet meadow areas, are essential for optimum habitat.

Sage-Grouse were abundant in pioneer times, but sagebrush eradication and intensive use of lands by domestic livestock have reduced their numbers. Sage-Grouse range is declining in Utah in both quantity and quality. Indiscriminate spraying of sagebrush, cropland conversion, and over-grazing of mountain meadows are the causes. The result has been an overall decline in Sage-Grouse populations. Sage-Grouse range has declined 50 percent from historical times. Greater Sage-Grouse are native to Utah and are listed as a sensitive species by the Utah Division of Wildlife Resources.

Yellow-billed Cuckoo

Currently, the range of the yellow-billed cuckoo is limited to disjunct fragments of riparian habitats from northern Utah, western Colorado, southwestern Wyoming, and southeastern Idaho southward into northwestern Mexico and westward into southern Nevada and California. Cuckoos are long-range migrants that winter in northern South America in tropical deciduous and evergreen forests. The current distribution of yellow-billed cuckoos in Utah is poorly understood, though they appear to be an extremely rare breeder in lowland riparian habitats statewide. Yellow-billed cuckoos are considered a riparian obligate and are usually found in large tracts of cottonwood/willow habitats with dense sub-canopies (below 10 m [33 ft]).

Yellow-billed cuckoos are one of the latest migrants to arrive and breed in Utah. They arrive in extremely late May or early June and breed in late June through July. Cuckoos typically start their southerly migration by late August or early September. Yellow-billed cuckoos feed almost entirely on large insects that they glean from tree and shrub foliage. They feed primarily on caterpillars, including tent caterpillars. They also feed frequently on grasshoppers, cicadas, beetles, and katydids, occasionally on lizards, frogs, and eggs of other birds, and rarely on berries and fruits.

Least Chub

The least chub, *Iotichthys phlegethontis*, is a small minnow native to the Bonneville Basin. Although the species formerly occurred in many areas of the Bonneville Basin, including ponds and streams near Salt Lake City and the Great Salt Lake, it now occurs only in scattered springs and streams in western Utah. Much of the least chub's decline can be attributed to the introductions of nonnative fishes. Fortunately, efforts are now underway to expand the numbers and distribution of the least chub.

Spawning occurs during the spring and early summer. Eggs are fertilized in the water, and then sink until they attach to vegetation or the substrate. No parental care is given to eggs or young. Least chub eat primarily algae and small invertebrates, including mosquito larvae. The least chub is a schooling species that prefers areas of dense vegetation in slow-moving water.

Methodology

On July 18, 2013, Ryan Pitts and Nicole Tolley with Horrocks Engineers surveyed the areas associated with the proposed project. Specifically, presence/absence surveys were conducted for federally-listed ESA species within the full project area. In addition, vegetation type, hydrology, soil characteristics, and general biological observations were recorded throughout.

Furthermore, exact species localities of federally-listed ESA species known to occur within and adjacent to the project area were obtained from the Utah Natural Heritage Program’s (UNHP) database.

Findings

The project area contains pastures and hayed areas that include uplands, mesic/alkali areas, some wetlands, a canal, and associated lateral ditches. The wetlands in the project area are primarily the result of many years of flood irrigation with a prominent restrictive clay layer 12 to 18-inches deep. At this time, the practice of flood irrigating the site has been eliminated, as the land was recently acquired by Logan City in anticipation of the wastewater treatment facility and the wetlands have greatly diminished over this past growing season.

There were no observations or evidence (scat, tracks, sightings) of the presence of any ESA species listed above during survey activities. Nor were there observations of suitable habitat for any of the ESA species, with the exception of the ULT, as discussed in further detail below. Finally, UNHP data did not reveal the presence of any federally-listed ESA species in the project area.

On July 18, 2013, a ULT survey was conducted for the entire project area. Although no ULT individuals were discovered, the survey revealed the presence of marginal habitat within the proposed project area.

Conclusion

Based on field observations, presence/absence surveys, suitable habitat requirements, UNHP data, and the scope of the project, it has been determined that the proposed project would have **no effect** on the federally-listed Maguire primrose, Canada lynx, greater sage-grouse, yellow-billed cuckoo, and least chub.

Presence/absence surveys discovered no ULT individuals within the project area. Furthermore, the UNHP has no recorded observations of ULT individuals within ½ mile of the proposed wastewater treatment facility. Based on this information, the scope of the project, the presence of suitable habitat, and the potential for undiscovered dormant ULT individuals, it has been determined that the proposed project **may affect, but is not likely to adversely affect** the ULT.

References

U. S. Fish and Wildlife Service. 2013a. Federally Listed and Proposed Endangered, Threatened and Candidate Species and Critical Habitat in Utah - County List by Species. Updated April 2, 2013. Accessed August 29, 2013. Retrieved from http://www.fws.gov/utahfieldoffice/Documents/Lists/County%20per%20Species.pdf.

U. S. Fish and Wildlife Service. 2013b. FWS Critical Habitat for Threatened & Endangered Species, Critical Habitat Portal. Accessed August 29, 2013. Retrieved from http://criticalhabitat.fws.gov/crithab/.

Utah Division of Wildlife Resources. 2013. Utah Conservation Data Center, Learn About Utah's Species. Accessed August 29, 2013. Retrieved from http://dwrcdc.nr.utah.gov/ucdc/default.asp.

August 21, 2015

Claudia Cottle
Bear Lake Watch
4544 Hwy 89
Fish Haven ID 83287

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

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1265 E Fort Union Blvd, Suite 200
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Sincerely,
Logan City Environmental Department

Jim Harps
Wastewater Treatment Manager

Enclosures: Project Description and Maps of the Existing and Proposed Location of Wastewater Facilities

cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

LOGAN CITY

WASTEWATER TREATMENT FACILITY

PROPOSED PROJECT DESCRIPTION

The Utah Division of Water Quality (DWQ) has identified Cutler Reservoir as being impaired due to low dissolved oxygen concentrations and excess total phosphorus. A Total Maximum Daily Load (TMDL) study for Cutler Reservoir conducted by DWQ resulted in limits to the amount of phosphorus that point and non-point source dischargers may contribute to the system in an effort to protect the beneficial uses of the water body. The Cutler Reservoir TMDL was approved by the EPA in February 2010. Subsequently, DWQ has allocated the TMDL to individual point source dischargers, resulting in a limit on the amount of total phosphorus that can be discharged and a compliance schedule for upgrading treatment facilities.

The City of Logan (City) owns and operates a lagoon system that provides wastewater treatment for the City, Utah State University, and the surrounding communities of Hyde Park, Nibley, North Logan, Providence, River Heights, and Smithfield. This facility was identified as a point source discharge to Cutler Reservoir, and as such, the City received notification of a new limit on total effluent phosphorus that must be met by 2020 as part of a new TMDL. The City must reduce the mass of phosphorus discharged from their facility by approximately 60 percent to meet the annual load limit, which results in a total phosphorus effluent concentration of approximately 1.0 milligrams per liter or less. The lagoon system as currently configured is not capable of meeting the total phosphorus limit imposed by the TMDL.

Additionally, the City is required to reduce ammonia to lower levels as a result of a new toxicity standard promulgated by the EPA and enforced by the DWQ. The new standards require that average effluent ammonia be less than 3.0 mg/L during winter months and less than 1.3 mg/L during summer months. The lagoon system as currently configured, along with existing wetland polishing cells constructed by the City in 2004, do not provide sufficient ammonia removal for the City to meet this new standard. In January 2013, DWQ formally notified the City of the new proposed ammonia limits and asked that facility planning for phosphorus be expanded to include ammonia removal as well.

Numerous treatment technologies and alternatives were evaluated to determine the most cost effective solution for the City to meet the new limits for phosphorus and nitrogen. A bioreactor process followed by chemical addition and filtration for phosphorus removal was recommended as the preferred treatment alternative. Proposed new facilities are as follows: a new headworks with grit removal, bioreactors with anoxic zones to allow for nitrogen removal (nitrification and denitrification), secondary clarifiers, return and waste activated sludge (RAS/WAS) pumping

facility, tertiary filters with chemical addition for phosphorus removal, and ultraviolet (UV) disinfection.

Logan City recently purchased property adjacent to their existing lagoon system that was used by the previous owner for livestock grazing. The proposed new facilities as shown in Figure 1 overlay the former grazing area on the east and Logan City police department shooting range on the west. Construction activities for the new mechanical treatment facilities will include construction of the large concrete basins for the biological and settling processes, new enclosed buildings for the headworks, RAS/WAS pumping, and joint facility for the filters and UV disinfection. Additionally, there will be yard piping installed to connect the new and exiting facilities, and aged equipment in the existing headworks facility will be replaced. The location of both the existing and new facilities within the Cache Valley is shown in Figure 2.

The conceptual site plans call for construction of the new treatment facilities upon driven piles and imported structural fill at an elevation similar in height as the existing grade. Building on imported fill and driven piles will address concerns regarding soft underlying native soils. Top soils will be stripped and preserved during early construction activities and will be used to dress and landscape embankments that may be visible from State Route 30, and to seed a wetland mitigation project.

The project will require a permit from the United States Army Corp of Engineers (USACE) for impacts to wetlands found on the property purchased by the City for the proposed mechanical treatment facility. The facility has a footprint of approximately 30 acres and although the facility is planned to be located on the driest areas of the site there will impacts to as much as 10.14 acres of wet meadow vegetation and existing water ways. The City proposes to perform this mitigation on property directly south of the current lagoon system in an area located west of the existing landfill and south of State Route 30 (200 North) as shown in Figure 3. The City owns this property and it is viewed as a favorable location by USACE as it is adjacent to successful constructed wetland sites as previous mitigation for unrelated projects and would result in an expansion of wetland habitat.

Copies of the documents associated with this project may be viewed at the Logan Environmental Department building (153 North 1400 West) or at the Logan City Library (255 North Main). These documents include: Wetland Mitigation and Monitoring Plan, the Wastewater Treatment Master Plan, Phase I Environmental Assessment, Archeological Resource Investigation, and draft Environmental Assessment.

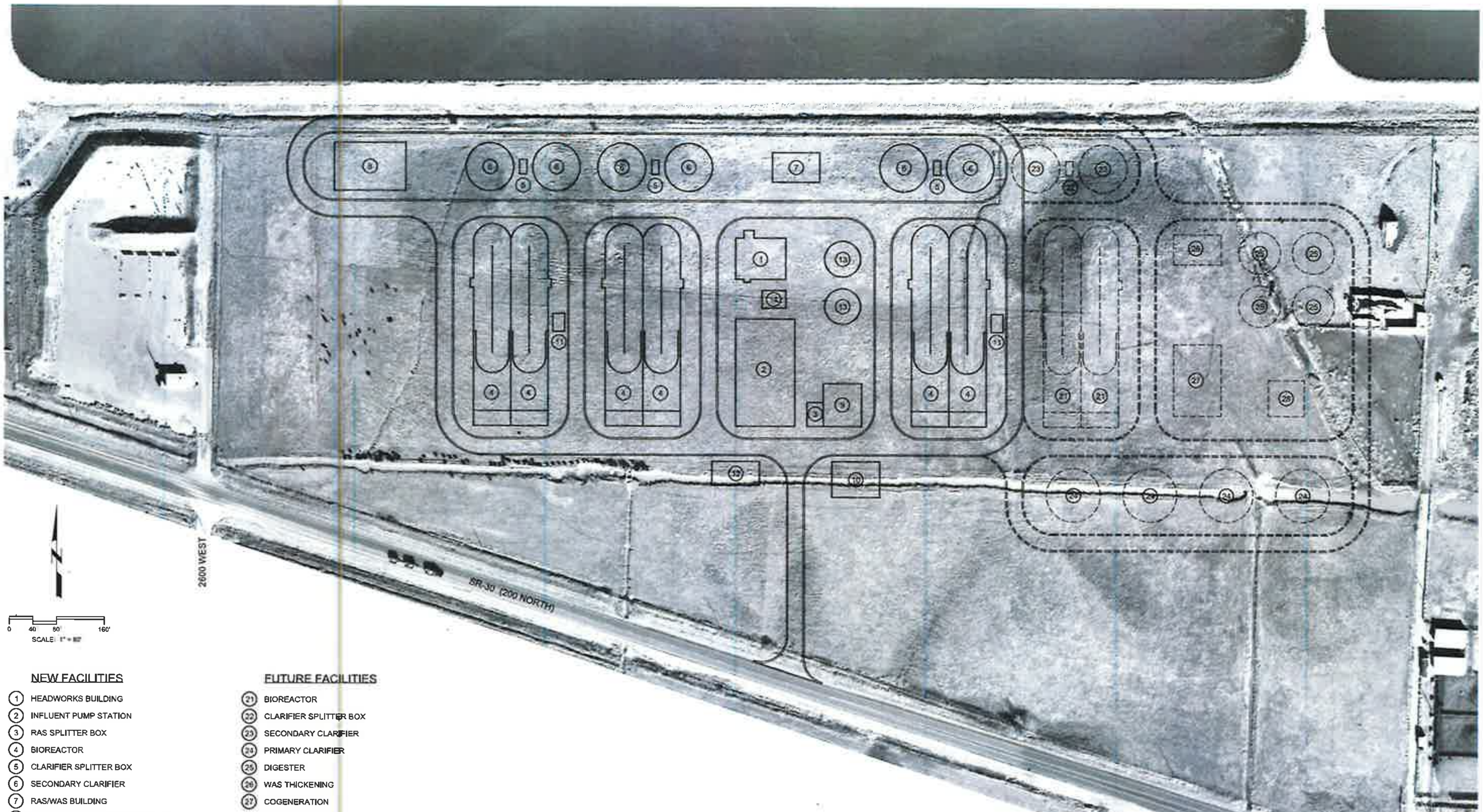

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Figure No. 1
CONCEPTUAL SITE PLAN
CITY OF LOGAN

carollo

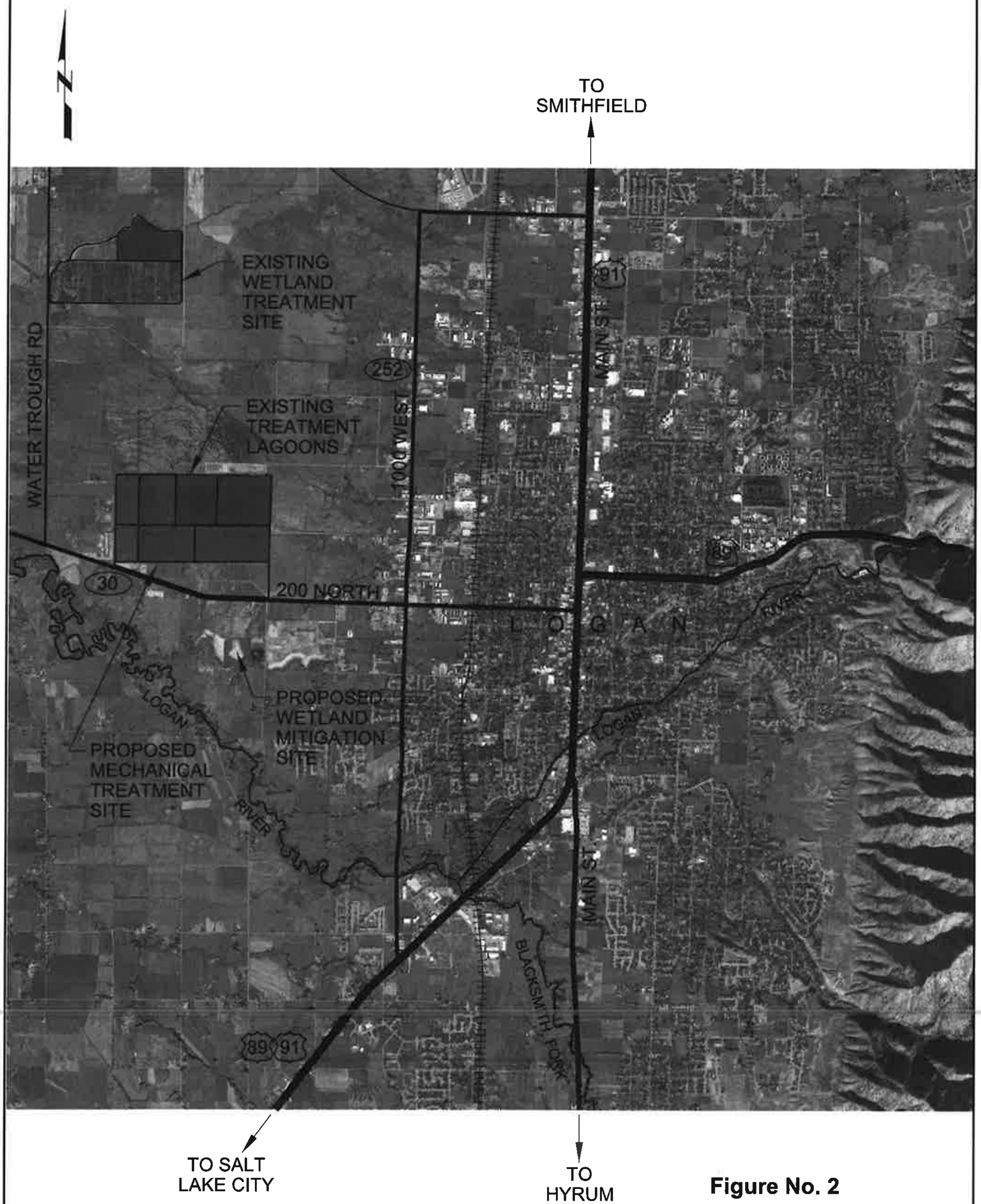

Figure No. 2
VICINITY MAP
CITY OF LOGAN

carollo

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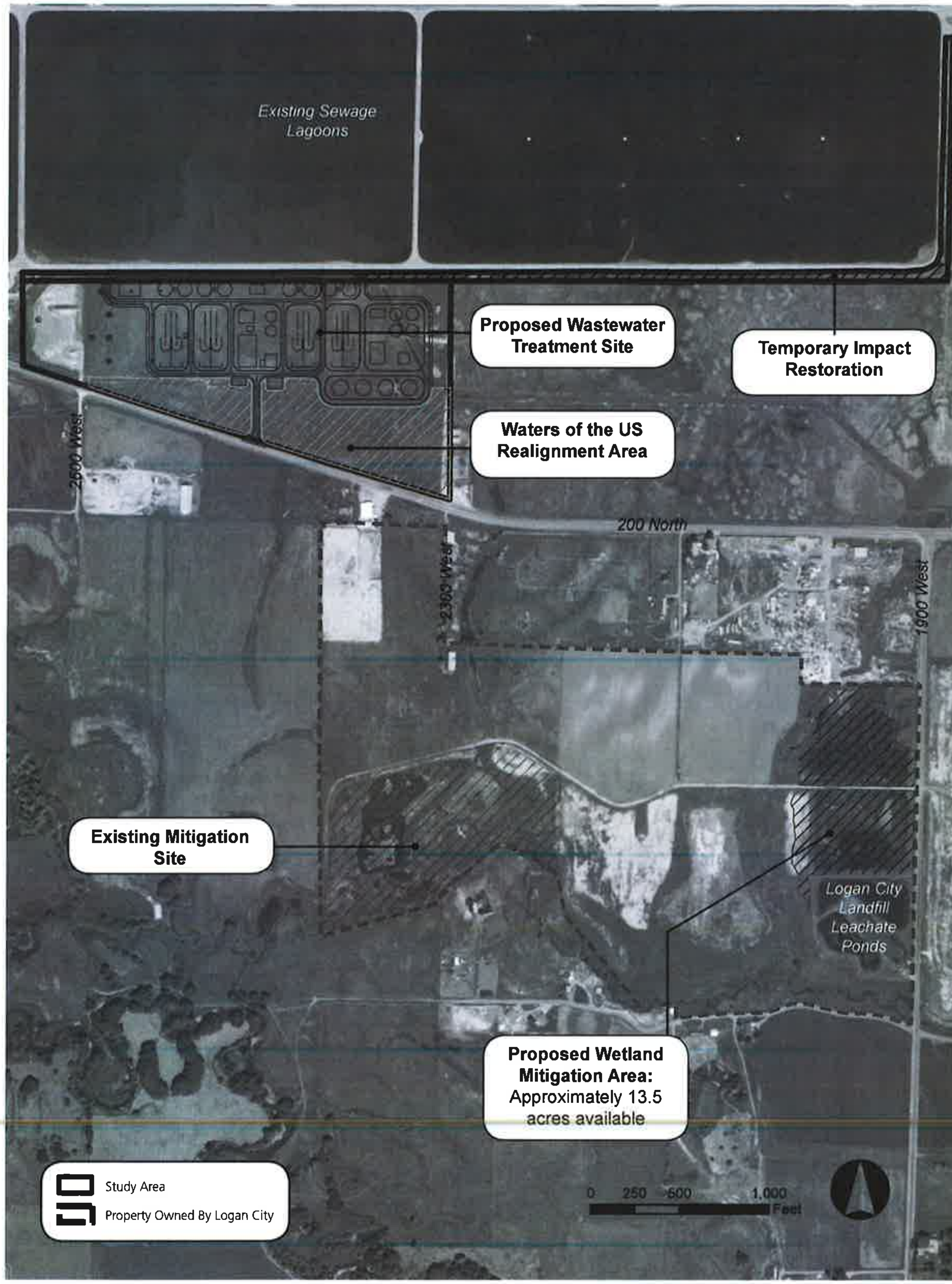

Figure No. 3

PROPOSED WETLAND MITIGATION SITE

CITY OF LOGAN

carollo

August 21, 2015

Dan Davidson
Bear River Canal Company
275 North 1600 East
Tremonton UT 84337

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

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Jim Harps
Wastewater Treatment Manager

Enclosures: Project Description and Maps of the Existing and Proposed Location of Wastewater Facilities

cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 21, 2015

Charles Holmgren
Bear River Canal Company
275 North 1600 East
Tremonton UT 84337

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August 21, 2015

Jack Barnett
Bear River Commission
106 West 500 South Suite 101
Bountiful UT 84010

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Bear River Watershed Council
PO Box 404
Richmond UT 84333

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Jon White
Blacksmith Fork SCD
1860 North 100 East
North Logan UT 84341

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August 21, 2015

Sande Emile
Cache Chamber of Commerce
160 North Main
Logan UT 84321

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August 21, 2015

Richard Mueller
Bridgerland Audubon Society
1595 East 1385 North
North Logan UT 84341

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August 21, 2015

Bryan Dixon
Bridgerland Audubon Society
10 Heritage Cove
Logan UT 84321-3300

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LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 21, 2015

Craig Buttars
Cache County Executive
199 North Main
Logan UT 84321

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Logan City respectfully requests your review of the proposed project in order to identify potential resources, concerns, requirements, or recommendations that you may have relating to the proposed project. Written comments or questions concerning the proposed action should be addressed to:

J. Clinton Rogers, P.E.
Carollo Engineers
1265 E Fort Union Blvd, Suite 200
Midvale, UT 84047

153 North 1400 West Logan, Utah 84321-6964 • ph: 435.716.9755 • fx: 435.716.9751 environmental.loganutah.org

Your response to this request within 30 days of the date of this letter is appreciated. If you need any further information or wish to discuss the project, please contact Carollo Engineers at (801)-233-2519 or crogers@carollo.com . Thank you for your consideration in this matter.

Sincerely,
Logan City Environmental Department

Jim Harps
Wastewater Treatment Manager

Enclosures: Project Description and Maps of the Existing and Proposed Location of Wastewater Facilities

cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 21, 2015

Bob Fotheringham
Cache County Water Department
199 North Main
Logan UT 84321

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

Logan City, in cooperation with the Utah Division of Water Quality (DWQ) is initiating an Environmental Assessment for a proposed Wastewater Treatment Project in Logan City, Cache County, Utah. The Environmental Assessment is being performed pursuant to the requirements of the National Environmental Policy Act (NEPA) for the State of Utah Division of Water Quality (DWQ).

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LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 21, 2015

Craig Miller
Utah DNR – Water Resources
PO Box 146201
Salt Lake City UT 84114-6201

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

Logan City, in cooperation with the Utah Division of Water Quality (DWQ) is initiating an Environmental Assessment for a proposed Wastewater Treatment Project in Logan City, Cache County, Utah. The Environmental Assessment is being performed pursuant to the requirements of the National Environmental Policy Act (NEPA) for the State of Utah Division of Water Quality (DWQ).

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William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 21, 2015

Terry Howick / Doug Routledge / Paul Thompson
Utah Department of Natural Resources
PO Box 145610
Salt Lake City UT 84114-5610

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

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August 21, 2015

Eve Davies / Connely Baldwin
PacifiCorp
201 South Main St
Salt Lake City UT 84111

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August 26, 2015

Bill Young
Logan City Public Works
290 North 100 West
Logan UT 84321

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LOGAN CITY

WASTEWATER TREATMENT FACILITY

PROPOSED PROJECT DESCRIPTION

The Utah Division of Water Quality (DWQ) has identified Cutler Reservoir as being impaired due to low dissolved oxygen concentrations and excess total phosphorus. A Total Maximum Daily Load (TMDL) study for Cutler Reservoir conducted by DWQ resulted in limits to the amount of phosphorus that point and non-point source dischargers may contribute to the system in an effort to protect the beneficial uses of the water body. The Cutler Reservoir TMDL was approved by the EPA in February 2010. Subsequently, DWQ has allocated the TMDL to individual point source dischargers, resulting in a limit on the amount of total phosphorus that can be discharged and a compliance schedule for upgrading treatment facilities.

The City of Logan (City) owns and operates a lagoon system that provides wastewater treatment for the City, Utah State University, and the surrounding communities of Hyde Park, Nibley, North Logan, Providence, River Heights, and Smithfield. This facility was identified as a point source discharge to Cutler Reservoir, and as such, the City received notification of a new limit on total effluent phosphorus that must be met by 2020 as part of a new TMDL. The City must reduce the mass of phosphorus discharged from their facility by approximately 60 percent to meet the annual load limit, which results in a total phosphorus effluent concentration of approximately 1.0 milligrams per liter or less. The lagoon system as currently configured is not capable of meeting the total phosphorus limit imposed by the TMDL.

Additionally, the City is required to reduce ammonia to lower levels as a result of a new toxicity standard promulgated by the EPA and enforced by the DWQ. The new standards require that average effluent ammonia be less than 3.0 mg/L during winter months and less than 1.3 mg/L during summer months. The lagoon system as currently configured, along with existing wetland polishing cells constructed by the City in 2004, do not provide sufficient ammonia removal for the City to meet this new standard. In January 2013, DWQ formally notified the City of the new proposed ammonia limits and asked that facility planning for phosphorus be expanded to include ammonia removal as well.

Numerous treatment technologies and alternatives were evaluated to determine the most cost effective solution for the City to meet the new limits for phosphorus and nitrogen. A bioreactor process followed by chemical addition and filtration for phosphorus removal was recommended as the preferred treatment alternative. Proposed new facilities are as follows: a new headworks with grit removal, bioreactors with anoxic zones to allow for nitrogen removal (nitrification and denitrification), secondary clarifiers, return and waste activated sludge (RAS/WAS) pumping

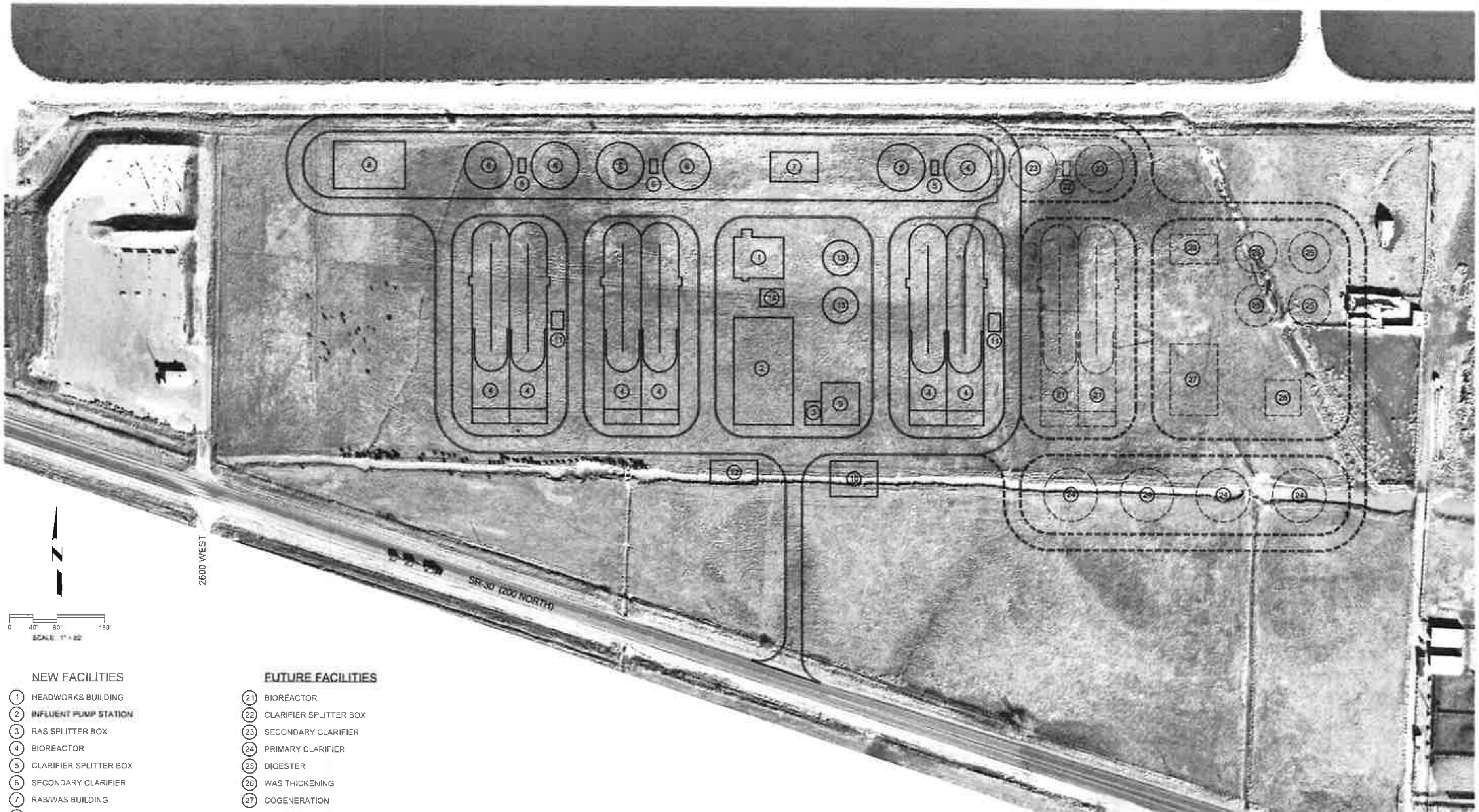
facility, tertiary filters with chemical addition for phosphorus removal, and ultraviolet (UV) disinfection.

Logan City recently purchased property adjacent to their existing lagoon system that was used by the previous owner for livestock grazing. The proposed new facilities as shown in Figure 1 overlay the former grazing area on the east and Logan City police department shooting range on the west. Construction activities for the new mechanical treatment facilities will include construction of the large concrete basins for the biological and settling processes, new enclosed buildings for the headworks, RAS/WAS pumping, and joint facility for the filters and UV disinfection. Additionally, there will be yard piping installed to connect the new and exiting facilities, and aged equipment in the existing headworks facility will be replaced. The location of both the existing and new facilities within the Cache Valley is shown in Figure 2.

The conceptual site plans call for construction of the new treatment facilities upon driven piles and imported structural fill at an elevation similar in height as the existing grade. Building on imported fill and driven piles will address concerns regarding soft underlying native soils. Top soils will be stripped and preserved during early construction activities and will be used to dress and landscape embankments that may be visible from State Route 30, and to seed a wetland mitigation project.

The project will require a permit from the United States Army Corp of Engineers (USACE) for impacts to wetlands found on the property purchased by the City for the proposed mechanical treatment facility. The facility has a footprint of approximately 30 acres and although the facility is planned to be located on the driest areas of the site there will impacts to as much as 10.14 acres of wet meadow vegetation and existing water ways. The City proposes to perform this mitigation on property directly south of the current lagoon system in an area located west of the existing landfill and south of State Route 30 (200 North) as shown in Figure 3. The City owns this property and it is viewed as a favorable location by USACE as it is adjacent to successful constructed wetland sites as previous mitigation for unrelated projects and would result in an expansion of wetland habitat.

Copies of the documents associated with this project may be viewed at the Logan Environmental Department building (153 North 1400 West) or at the Logan City Library (255 North Main). These documents include: Wetland Mitigation and Monitoring Plan, the Wastewater Treatment Master Plan, Phase I Environmental Assessment, Archeological Resource Investigation, and draft Environmental Assessment.



NEW FACILITIES

1. HEADWORKS BUILDING
2. INFLUENT PUMP STATION
3. RAS SPLITTER BOX
4. BIOREACTOR
5. CLARIFIER SPLITTER BOX
6. SECONDARY CLARIFIER
7. RAS/WAS BUILDING
8. TERTIARY TREATMENT / UV BUILDING
9. DEWATERING BUILDING
10. OPERATIONS BUILDING
11. ELECTRICAL BUILDING
12. EMERGENCY GENERATOR BUILDING
13. WAS STORAGE TANKS
14. ODOR CONTROL FACILITY

FUTURE FACILITIES

21. BIOREACTOR
22. CLARIFIER SPLITTER BOX
23. SECONDARY CLARIFIER
24. PRIMARY CLARIFIER
25. DIGESTER
26. WAS THICKENING
27. COGENERATION

Figure No. 1
CONCEPTUAL SITE PLAN
CITY OF LOGAN

carollo

User: TDonnell Plot Date: 14-AUG-2015 2:37:00 PM

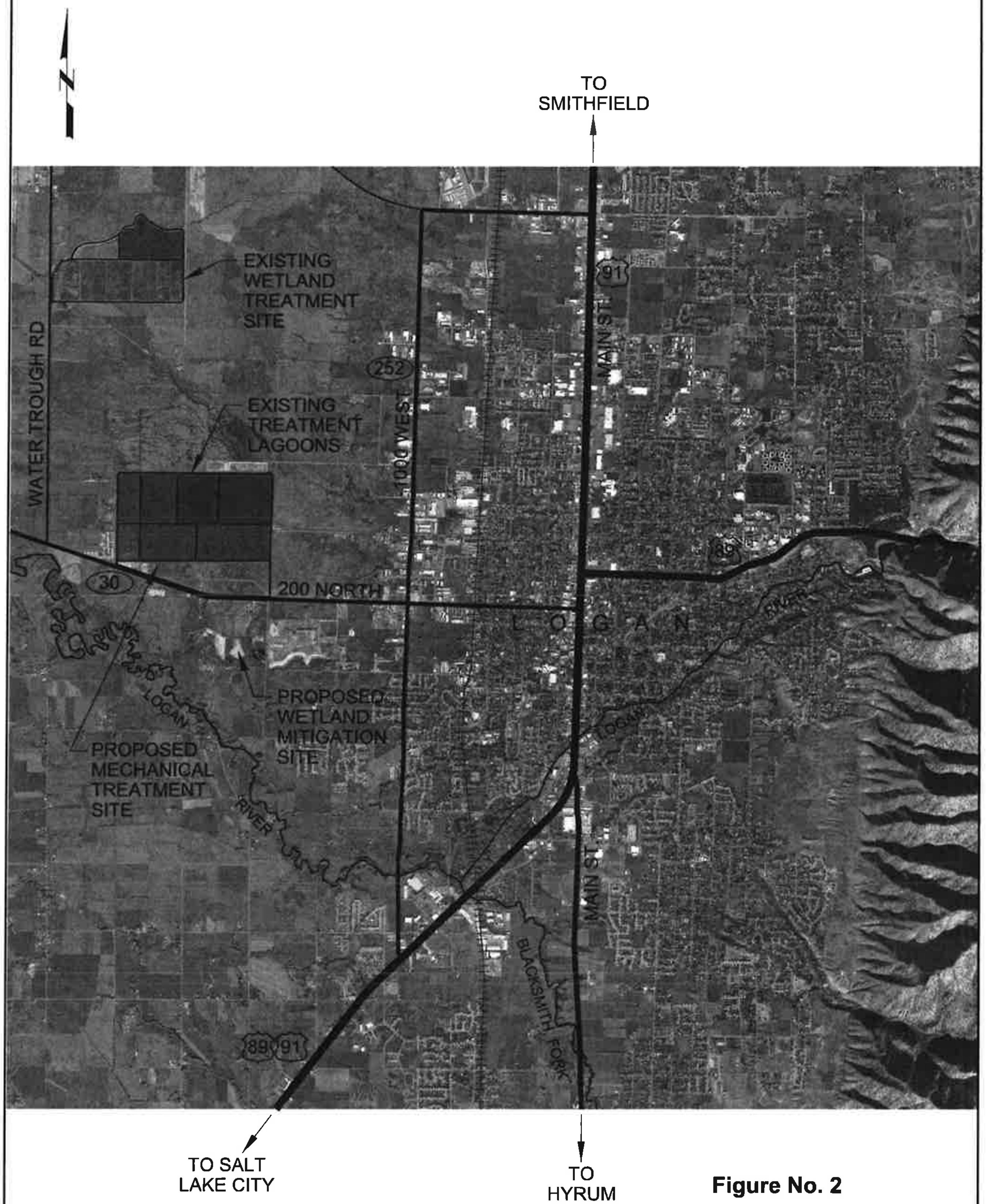


Figure No. 2
VICINITY MAP
CITY OF LOGAN

User: TDonnell Plot Date: 09-APR-2014 3:35:25 PM

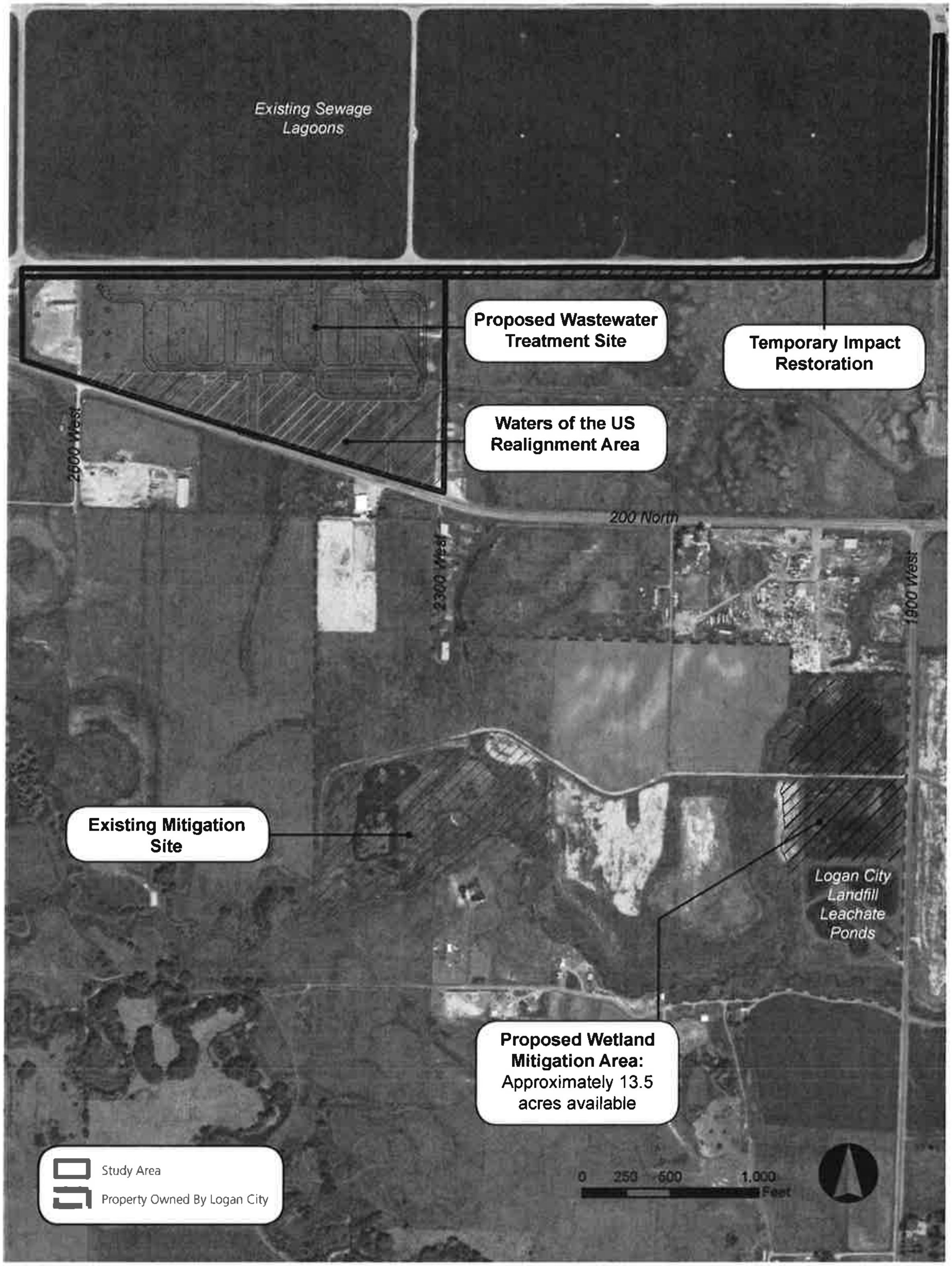


Figure No. 3

PROPOSED WETLAND MITIGATION SITE

CITY OF LOGAN

LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 26, 2015

Kris Peterson, Region One Director
Utah Department of Transportation
166 West Southwell St
Ogden UT 84404-4194

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

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Enclosures: Project Description and Maps of the Existing and Proposed Location of Wastewater Facilities

cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

LOGAN CITY UNITED IN SERVICE

ENVIRONMENTAL DEPARTMENT

August 26, 2015

Kevin Maughan
Hyrum City Sewage Treatment
83 West Main St
Hyrum UT 84319

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

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August 26, 2015

Joseph Larsen
Newton Reservoir Advisory Committee
5397 West 7200 North
Newton UT 84327

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

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August 26, 2015

Bruce Karren
North Cache Conservation District
1860 North 100 East
Logan UT 84341-1784

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August 26, 2015

Jon Hardman
National Resources Conservation Service
1860 North 100 East
Logan UT 84341

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

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J. Clinton Rogers, P.E.
Carollo Engineers
1265 E Fort Union Blvd, Suite 200
Midvale, UT 84047

Your response to this request within 30 days of the date of this letter is appreciated. If you need any further information or wish to discuss the project, please contact Carollo Engineers at (801)-233-2519 or crogers@carollo.com . Thank you for your consideration in this matter.

Sincerely,
Logan City Environmental Department

Jim Harps
Wastewater Treatment Manager

Enclosures: Project Description and Maps of the Existing and Proposed Location of Wastewater Facilities

cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 26, 2015

Justin Elsner
USU Extension
1860 North 100 East
Logan UT 84341

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

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William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 26, 2015

Nathan Daugs / Bracken Henderson
Utah Association of Conservation Districts
1860 North 100 East
Logan UT 84341

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

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Midvale, UT 84047

153 North 1400 West Logan, Utah 84321-6964 • ph: 435.716.9755 • fx: 435.716.9751 environmental.loganutah.org

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Wastewater Treatment Manager

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cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 26, 2015

Bob Barrett / Sharon Vaughn
US Fish and Wildlife Service
2155 Forest St
Brigham City UT 84302

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

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Wastewater Treatment Manager

Enclosures: Project Description and Maps of the Existing and Proposed Location of Wastewater Facilities

cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 26, 2015

Clark Israelsen
USU Cache County Extension
179 North Main
Logan UT 84321

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

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William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 26, 2015

Nancy Mesner
USU Water Quality Extension
5210 Old Main Hill – NR334
Logan UT 84322-5210

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

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Wastewater Treatment Manager

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cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

LOGAN CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 26, 2015

Scott Miller
USU Director, National Aquatic Monitoring Center
5210 Old Main Hill – BNR 162C
Logan UT 84322-5210

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

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Enclosures: Project Description and Maps of the Existing and Proposed Location of Wastewater Facilities

cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 26, 2015

Phaedra Budy
Utah State University
5210 Old Main Hill – NR 134
Logan UT 84322-5210

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Wastewater Treatment Manager

Enclosures: Project Description and Maps of the Existing and Proposed Location of Wastewater Facilities

cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 26, 2015

Wayne Wurtsbaugh
Utah State University
5210 Old Main Hill – BNR 106
Logan UT 84322-5210

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William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 26, 2015

Rhonda Miller
Utah State University
2300 Old Main Hill – ASTE 109
Logan UT 84322-2300

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

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LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 26, 2015

Arthur Caplan
Utah State University
4835 Old Main Hill – AGRS 230
Logan UT 84322-4835

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153 North 1400 West Logan, Utah 84321-6964 • ph: 435.716.9755 • fx: 435.716.9751 environmental.loganutah.org

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William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

LOGAN CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 26, 2015

Fred Selman
Northern Utah Conservation District
40 West Cache Valley Blvd Bldg 8C
Logan UT 84341

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

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William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 26, 2015

Don Hartle
Wellsville City
75 East Main St
Wellsville UT 84339

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

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Sincerely,
Logan City Environmental Department

Jim Harps
Wastewater Treatment Manager

Enclosures: Project Description and Maps of the Existing and Proposed Location of Wastewater Facilities

cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

LOGAN CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 26, 2015

Jim Watterson
4705 West 3800 North
Benson UT 84335

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

Logan City, in cooperation with the Utah Division of Water Quality (DWQ) is initiating an Environmental Assessment for a proposed Wastewater Treatment Project in Logan City, Cache County, Utah. The Environmental Assessment is being performed pursuant to the requirements of the National Environmental Policy Act (NEPA) for the State of Utah Division of Water Quality (DWQ).

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J. Clinton Rogers, P.E.
Carollo Engineers
1265 E Fort Union Blvd, Suite 200
Midvale, UT 84047

153 North 1400 West Logan, Utah 84321-6964 • ph: 435.716.9755 • fx: 435.716.9751 environmental.loganutah.org

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William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 26, 2015

Mark Peterson
Utah Farm Bureau – Water Quality Programs
9865 South State St
Sandy UT 84070

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

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cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 26, 2015

Paul Thompson / Ben Nadolski
Utah Division of Wildlife Resources
515 East 5300 South
Ogden UT 84405

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

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LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 26, 2015

Joan Degiorgio
The Nature Conservancy
559 East South Temple
Salt Lake UT 84102

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Madam:

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LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 26, 2015

Kayo Robertson
10 South 200 East
Smithfield UT 84335

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

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cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 26, 2015

Peter Kung
Logan River Water Users Association
346 North 400 West
Logan UT 84321

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

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William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 26, 2015

Darek Kimball / Paul Taylor
JUB Engineering
1047 South 100 West Suite 180
Logan UT 84321

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

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cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 26, 2015

Don Summit / Doug Stipes
EA Miller / Swift
410 North 200 West
Hyrum UT 84319

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

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William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 26, 2015

Bruce Lundquist
Cache County Farm Service Agency
1860 North 100 East
North Logan UT 84341

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

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LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 26, 2015

Greg Rowley
Gossner Foods
1051 North 1000 West
Logan UT 84321

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

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William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

August 26, 2015

Paul Leishman
136 North 100 East
Wellsville UT 84339

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

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LOGAN CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 26, 2015

Val Grant
1019 Rose St
Logan UT 84341

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

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August 26, 2015

Lonnie Shull
Utah Division of Water Quality
195 North 1950 West
Salt Lake City UT 84114

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

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The proposed project is to address the need for improvements at the current treatment site location. Currently, Logan City owns and operates a lagoon system that provides wastewater treatment for the City and surrounding communities. The treated effluent from the facility discharges to the Cutler Reservoir. The City is required to meet a new limit for total effluent phosphorous as result of a total maximum daily load (TMDL) limit issued by DWQ and approved by the United States Environmental Protection Agency (EPA) to protect and improve water quality in Cutler Reservoir. Additionally, the City is required to reduce ammonia to lower levels as a result of a new toxicity standard promulgated by the EPA and enforced by the DWQ.

Logan City's lagoon system as currently configured is not capable of meeting the new TMDL limit for total phosphorus or the new ammonia toxicity standard. An engineering evaluation identified a biological treatment process with tertiary phosphorus removal as the most cost effective means of meeting the new effluent limits. It is proposed that the project be built on land that Logan City has acquired, adjacent to their existing lagoon treatment system. Enclosed with this letter are figures that show the proposed project's location and conceptual site plan for the new facilities. A more detailed project description is also provided.

Logan City respectfully requests your review of the proposed project in order to identify potential resources, concerns, requirements, or recommendations that you may have relating to the proposed project. Written comments or questions concerning the proposed action should be addressed to:

J. Clinton Rogers, P.E.
Carollo Engineers
1265 E Fort Union Blvd, Suite 200
Midvale, UT 84047

Your response to this request within 30 days of the date of this letter is appreciated. If you need any further information or wish to discuss the project, please contact Carollo Engineers at (801)-233-2519 or crogers@carollo.com . Thank you for your consideration in this matter.

Sincerely,
Logan City Environmental Department

Jim Harps
Wastewater Treatment Manager

Enclosures: Project Description and Maps of the Existing and Proposed Location of Wastewater Facilities

cc: Issa Hamud, Logan City Environmental Director
William Damery, P.G., Environmental Scientist, Utah Division of Water Quality

LOGAN CITY

WASTEWATER TREATMENT FACILITY

PROPOSED PROJECT DESCRIPTION

The Utah Division of Water Quality (DWQ) has identified Cutler Reservoir as being impaired due to low dissolved oxygen concentrations and excess total phosphorus. A Total Maximum Daily Load (TMDL) study for Cutler Reservoir conducted by DWQ resulted in limits to the amount of phosphorus that point and non-point source dischargers may contribute to the system in an effort to protect the beneficial uses of the water body. The Cutler Reservoir TMDL was approved by the EPA in February 2010. Subsequently, DWQ has allocated the TMDL to individual point source dischargers, resulting in a limit on the amount of total phosphorus that can be discharged and a compliance schedule for upgrading treatment facilities.

The City of Logan (City) owns and operates a lagoon system that provides wastewater treatment for the City, Utah State University, and the surrounding communities of Hyde Park, Nibley, North Logan, Providence, River Heights, and Smithfield. This facility was identified as a point source discharge to Cutler Reservoir, and as such, the City received notification of a new limit on total effluent phosphorus that must be met by 2020 as part of a new TMDL. The City must reduce the mass of phosphorus discharged from their facility by approximately 60 percent to meet the annual load limit, which results in a total phosphorus effluent concentration of approximately 1.0 milligrams per liter or less. The lagoon system as currently configured is not capable of meeting the total phosphorus limit imposed by the TMDL.

Additionally, the City is required to reduce ammonia to lower levels as a result of a new toxicity standard promulgated by the EPA and enforced by the DWQ. The new standards require that average effluent ammonia be less than 3.0 mg/L during winter months and less than 1.3 mg/L during summer months. The lagoon system as currently configured, along with existing wetland polishing cells constructed by the City in 2004, do not provide sufficient ammonia removal for the City to meet this new standard. In January 2013, DWQ formally notified the City of the new proposed ammonia limits and asked that facility planning for phosphorus be expanded to include ammonia removal as well.

Numerous treatment technologies and alternatives were evaluated to determine the most cost effective solution for the City to meet the new limits for phosphorus and nitrogen. A bioreactor process followed by chemical addition and filtration for phosphorus removal was recommended as the preferred treatment alternative. Proposed new facilities are as follows: a new headworks with grit removal, bioreactors with anoxic zones to allow for nitrogen removal (nitrification and denitrification), secondary clarifiers, return and waste activated sludge (RAS/WAS) pumping

facility, tertiary filters with chemical addition for phosphorus removal, and ultraviolet (UV) disinfection.

Logan City recently purchased property adjacent to their existing lagoon system that was used by the previous owner for livestock grazing. The proposed new facilities as shown in Figure 1 overlay the former grazing area on the east and Logan City police department shooting range on the west. Construction activities for the new mechanical treatment facilities will include construction of the large concrete basins for the biological and settling processes, new enclosed buildings for the headworks, RAS/WAS pumping, and joint facility for the filters and UV disinfection. Additionally, there will be yard piping installed to connect the new and exiting facilities, and aged equipment in the existing headworks facility will be replaced. The location of both the existing and new facilities within the Cache Valley is shown in Figure 2.

The conceptual site plans call for construction of the new treatment facilities upon driven piles and imported structural fill at an elevation similar in height as the existing grade. Building on imported fill and driven piles will address concerns regarding soft underlying native soils. Top soils will be stripped and preserved during early construction activities and will be used to dress and landscape embankments that may be visible from State Route 30, and to seed a wetland mitigation project.

The project will require a permit from the United States Army Corp of Engineers (USACE) for impacts to wetlands found on the property purchased by the City for the proposed mechanical treatment facility. The facility has a footprint of approximately 30 acres and although the facility is planned to be located on the driest areas of the site there will impacts to as much as 10.14 acres of wet meadow vegetation and existing water ways. The City proposes to perform this mitigation on property directly south of the current lagoon system in an area located west of the existing landfill and south of State Route 30 (200 North) as shown in Figure 3. The City owns this property and it is viewed as a favorable location by USACE as it is adjacent to successful constructed wetland sites as previous mitigation for unrelated projects and would result in an expansion of wetland habitat.

Copies of the documents associated with this project may be viewed at the Logan Environmental Department building (153 North 1400 West) or at the Logan City Library (255 North Main). These documents include: Wetland Mitigation and Monitoring Plan, the Wastewater Treatment Master Plan, Phase I Environmental Assessment, Archeological Resource Investigation, and draft Environmental Assessment.

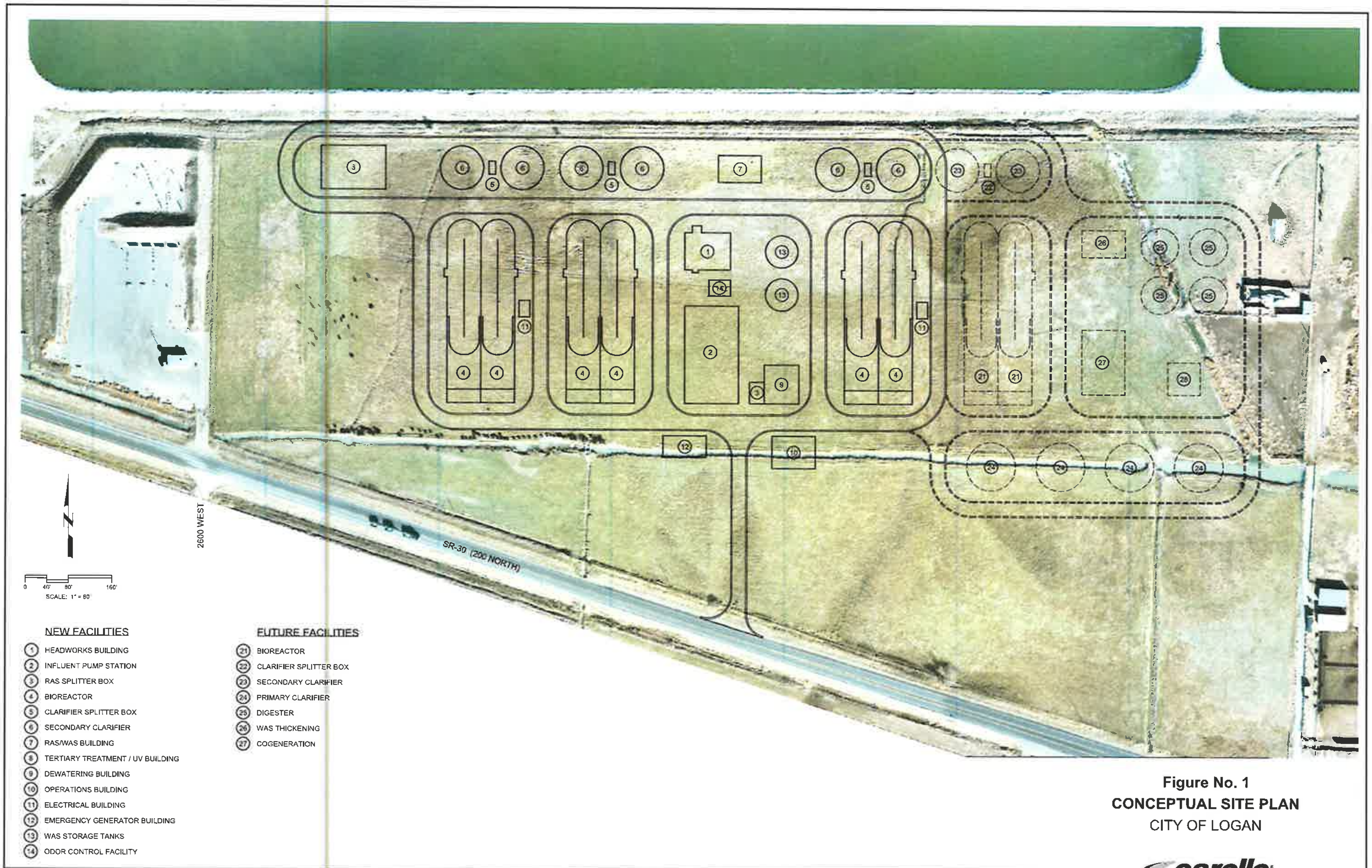

Figure No. 1
CONCEPTUAL SITE PLAN
CITY OF LOGAN

carollo

User: TDonnell Plot Date: 14-AUG-2015 2:37:00 PM

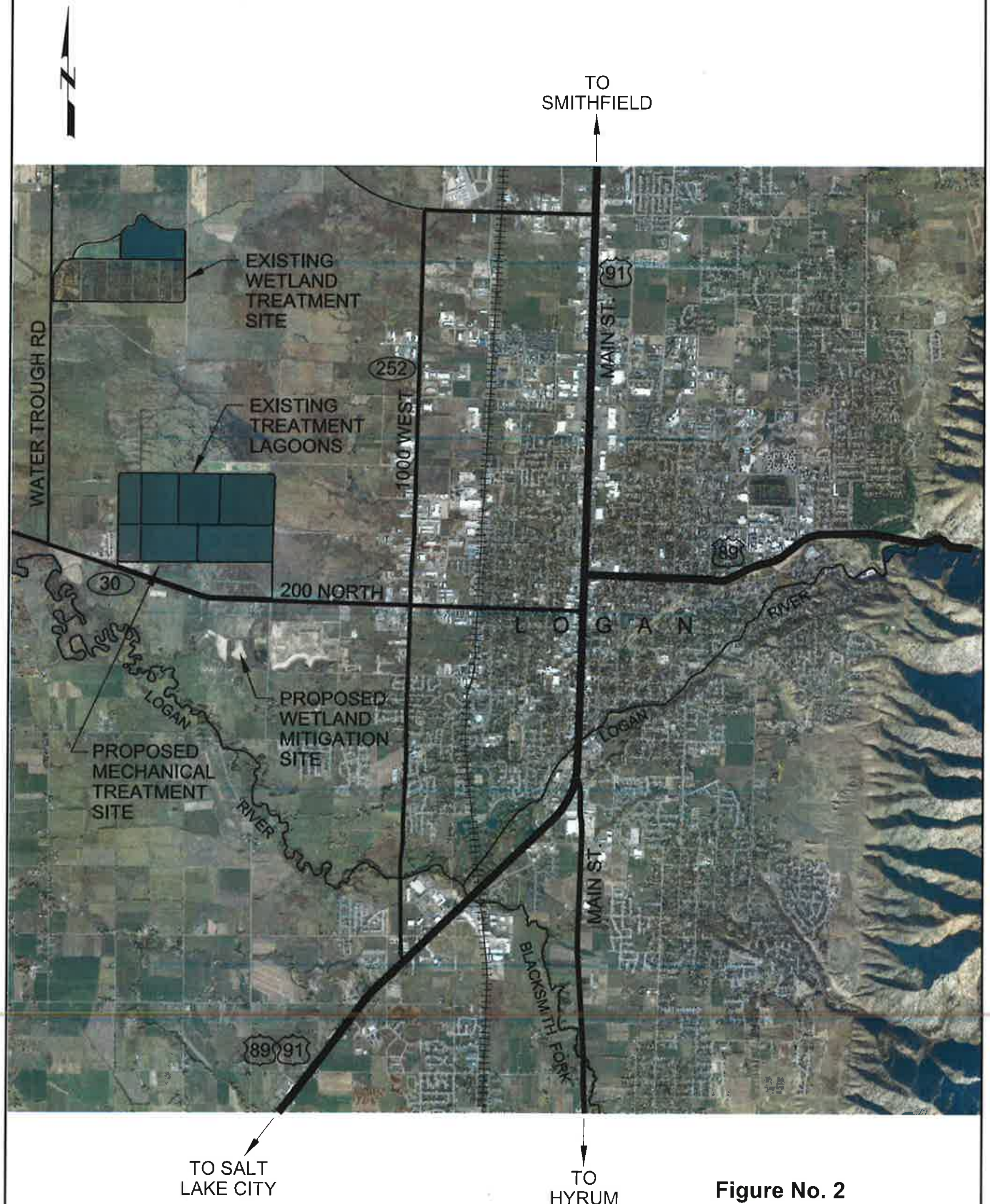

Figure No. 2
VICINITY MAP
CITY OF LOGAN

User: TDonnell Plot Date: 09-APR-2014 3:35:25 PM

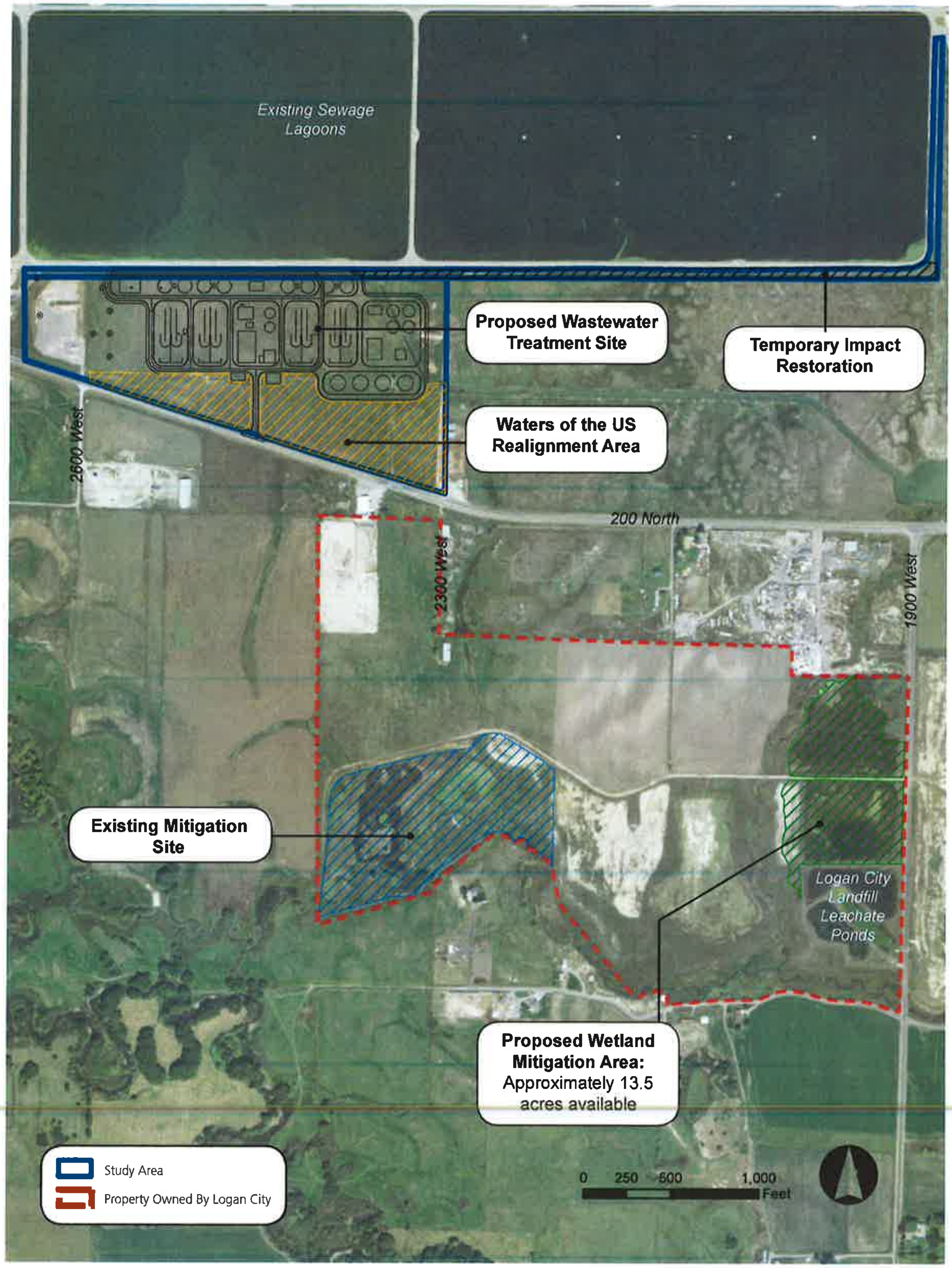

Figure No. 3

PROPOSED WETLAND MITIGATION SITE

CITY OF LOGAN

LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

August 26, 2015

Mike Allred
Utah Division of Water Quality
195 North 1950 West
Salt Lake City UT 84114

Subject: Logan City Wastewater Treatment Environmental Assessment - Request for Comments

Dear Sirs:

Logan City, in cooperation with the Utah Division of Water Quality (DWQ) is initiating an Environmental Assessment for a proposed Wastewater Treatment Project in Logan City, Cache County, Utah. The Environmental Assessment is being performed pursuant to the requirements of the National Environmental Policy Act (NEPA) for the State of Utah Division of Water Quality (DWQ).

The proposed project is to address the need for improvements at the current treatment site location. Currently, Logan City owns and operates a lagoon system that provides wastewater treatment for the City and surrounding communities. The treated effluent from the facility discharges to the Cutler Reservoir. The City is required to meet a new limit for total effluent phosphorous as result of a total maximum daily load (TMDL) limit issued by DWQ and approved by the United States Environmental Protection Agency (EPA) to protect and improve water quality in Cutler Reservoir. Additionally, the City is required to reduce ammonia to lower levels as a result of a new toxicity standard promulgated by the EPA and enforced by the DWQ.

Logan City's lagoon system as currently configured is not capable of meeting the new TMDL limit for total phosphorus or the new ammonia toxicity standard. An engineering evaluation identified a biological treatment process with tertiary phosphorus removal as the most cost effective means of meeting the new effluent limits. It is proposed that the project be built on land that Logan City has acquired, adjacent to their existing lagoon treatment system. Enclosed with this letter are figures that show the proposed project's location and conceptual site plan for the new facilities. A more detailed project description is also provided.

Logan City respectfully requests your review of the proposed project in order to identify potential resources, concerns, requirements, or recommendations that you may have relating to the proposed project. Written comments or questions concerning the proposed action should be addressed to:

J. Clinton Rogers, P.E.
Carollo Engineers
1265 E Fort Union Blvd, Suite 200
Midvale, UT 84047

153 North 1400 West Logan, Utah 84321-6964 • ph: 435.716.9755 • fx: 435.716.9751 environmental.loganutah.org

Your response to this request within 30 days of the date of this letter is appreciated. If you need any further information or wish to discuss the project, please contact Carollo Engineers at (801)-233-2519 or crogers@carollo.com . Thank you for your consideration in this matter.

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Logan City Environmental Department

Jim Harps
Wastewater Treatment Manager

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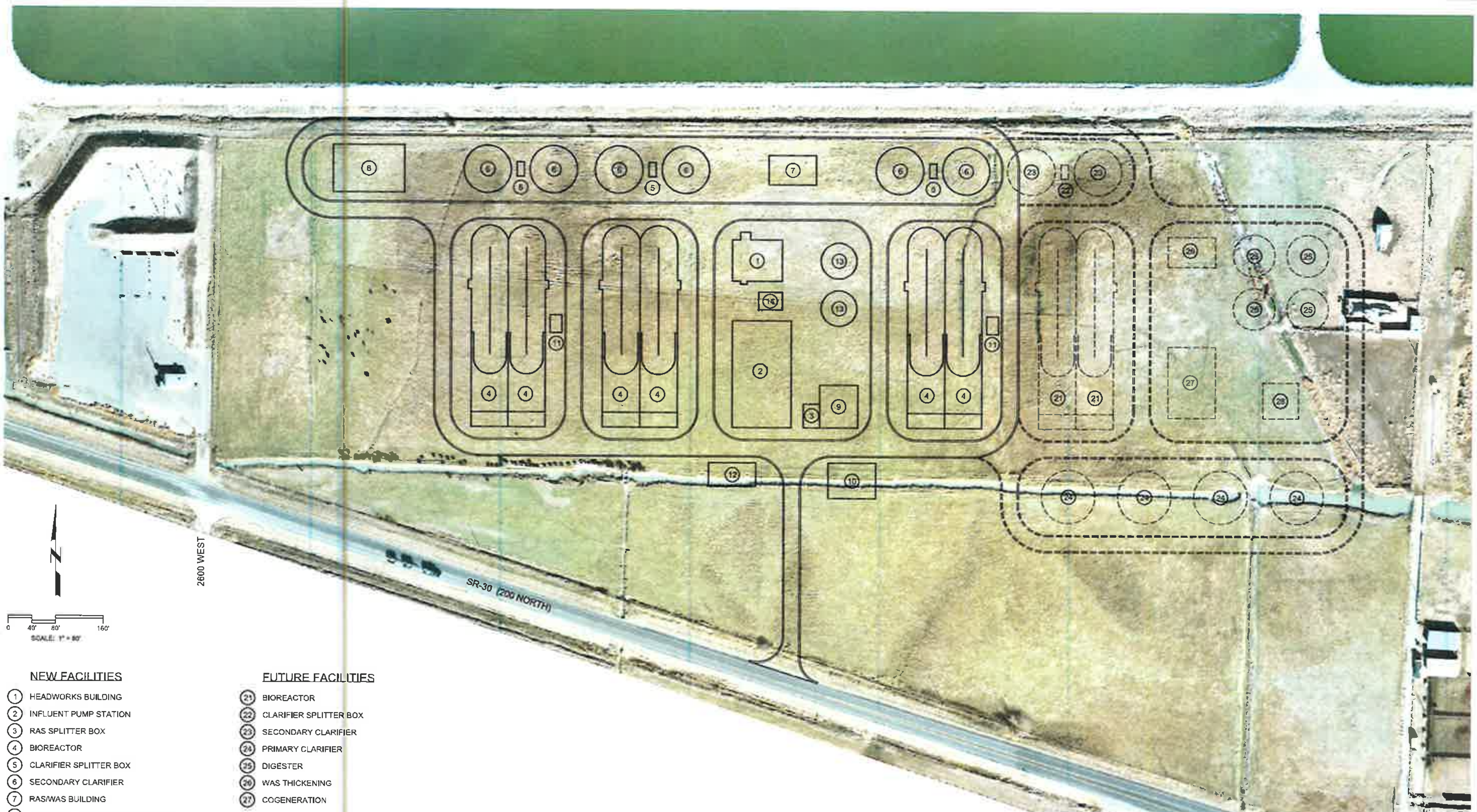

NEW FACILITIES

1. HEADWORKS BUILDING
2. INFLUENT PUMP STATION
3. RAS SPLITTER BOX
4. BIOREACTOR
5. CLARIFIER SPLITTER BOX
6. SECONDARY CLARIFIER
7. RAS/WAS BUILDING
8. TERTIARY TREATMENT / UV BUILDING
9. DEWATERING BUILDING
10. OPERATIONS BUILDING
11. ELECTRICAL BUILDING
12. EMERGENCY GENERATOR BUILDING
13. WAS STORAGE TANKS
14. ODOR CONTROL FACILITY

FUTURE FACILITIES

21. BIOREACTOR
22. CLARIFIER SPLITTER BOX
23. SECONDARY CLARIFIER
24. PRIMARY CLARIFIER
25. DIGESTER
26. WAS THICKENING
27. COGENERATION

Figure No. 1
CONCEPTUAL SITE PLAN
CITY OF LOGAN

carollo

User: TDonnell Plot Date: 14-AUG-2015 2:37:00 PM

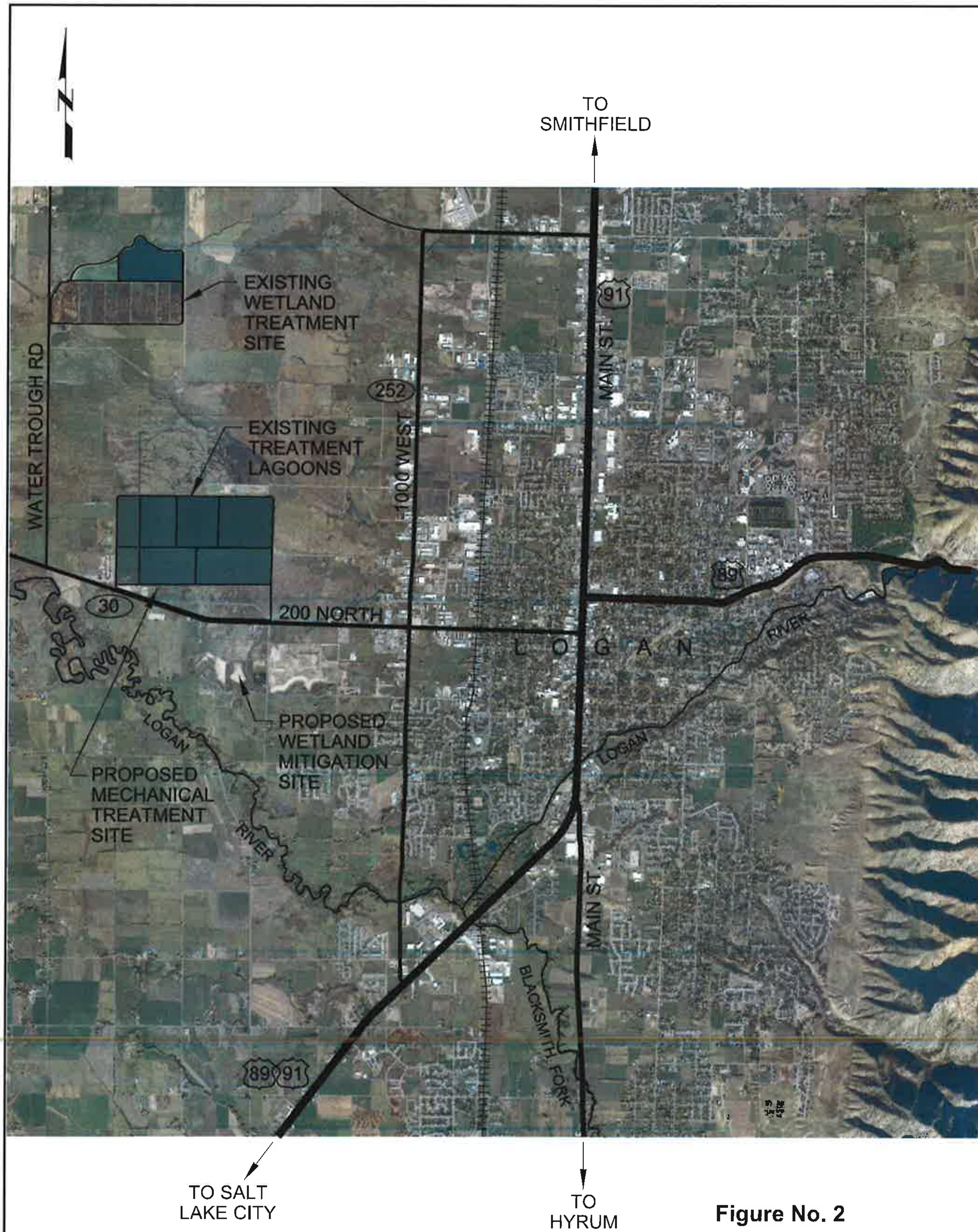

Figure No. 2
VICINITY MAP
CITY OF LOGAN

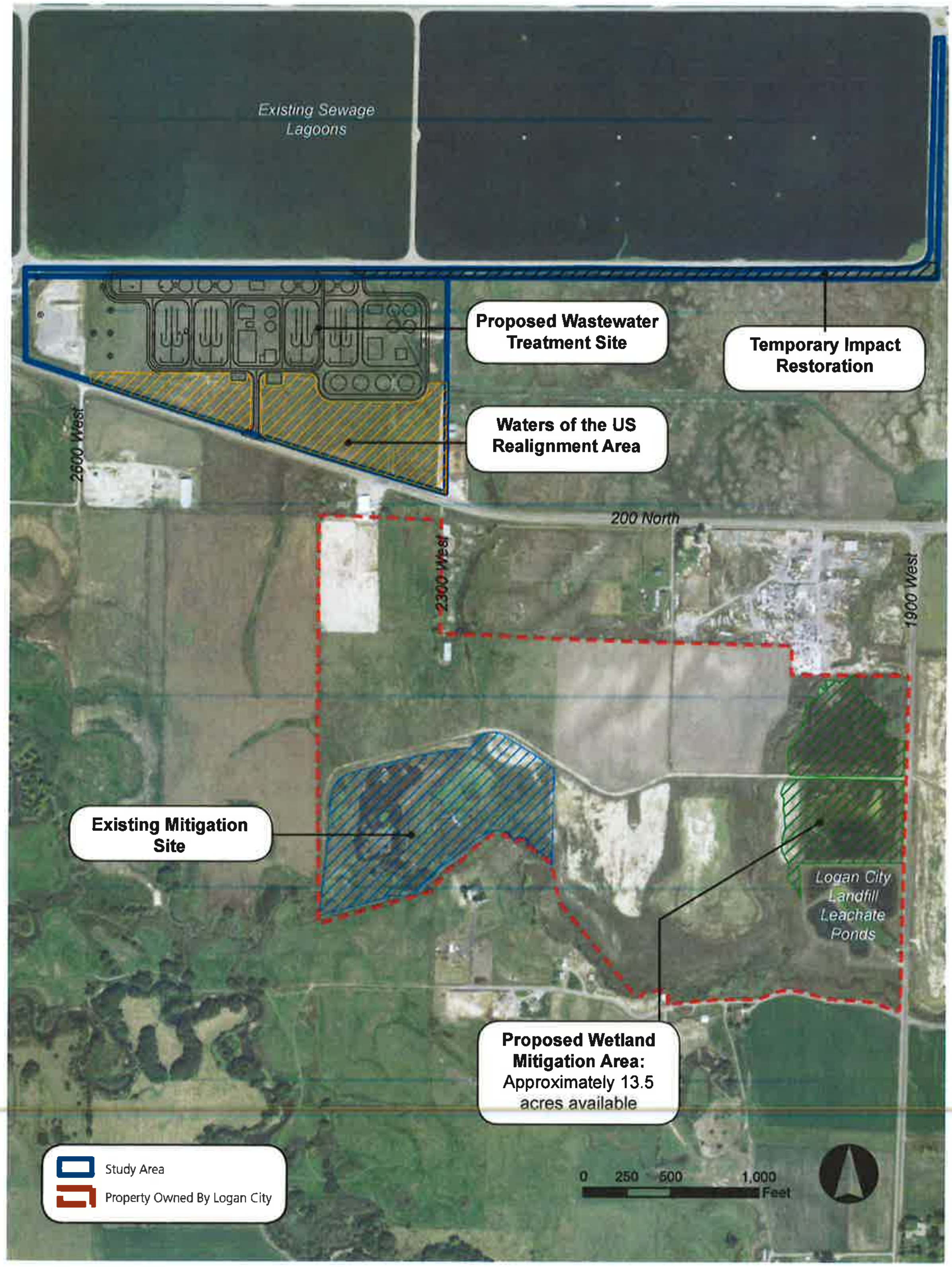

Figure No. 3

PROPOSED WETLAND MITIGATION SITE

CITY OF LOGAN

carollo

carollo engineers

TELEPHONE MEMORANDUM

Route

DATE 8/27/15 TIME 10:26 am PROJECT NO. 8621A.10

FROM Greg Colton TO Clint Rogers

OF Nearby Property Owner TELEPHONE NO. (801) 971-8766

SUBJECT Logan Project

Greg - left me a voicemail asking the location of the proposed project as he owns property on the north side of the lagoons.

I called him back at 2:37pm on 8/27/15 and explained that the project was south of the existing lagoons. That eased his concern and he had no more questions.

[signature]

W:\FORMS\WCO\PRINTED\TELEMEMO.PRN

Clint Rogers

From: Sandy Emile <semile@cachechamber.com>
Sent: Friday, August 28, 2015 12:31 PM
To: Clint Rogers
Subject: Logan wastewater facility question

Carollo Engineers,

I received a packet of information regarding the Logan Wastewater expansion and I had a question. Will the expansion cause additional wetland mitigation problems for the eventual expansion and widening of SR 30?

I agree that the site seems to be the best place for the water treatment facility and it is obviously needed.

Thank you for taking the time to inform us of what is being considered to address this problem.

Regards,
Sandy Emile
Cache Chamber of Commerce

Clint Rogers' reply 8/31/15 at 7:47 AM:
"Sandy, Thank you for your interest in the proposed Logan Wastewater Expansion Project. We recognize that there is likely an expansion of State Route 30 (SR 30) in the near future. For this project the new facilities and wetland mitigation site have been set back from the road such that we do not believe we are in conflict with any Utah Department of Transportation (UDOT) plans for SR 30. The area of realignment for Water of the United States (US) located between SR 30 and the proposed treatment facility will be coordinated such that any relocation of canals and wetlands necessary for construction will not be relocated into SR 30 expansion easements. Figure 3 attached for reference.

"Additionally, UDOT is one of the agencies that we have asked to provide comments on our proposed project, and we have had discussions about a site access point off of SR 30 to the facilities which is reflected in our preliminary site plan.

"Please let me know if you have any other questions, and thanks again for your input."

Tyler Richards (tyler.richards@loganutah.org) was copied on this email.

USDA

United States Department of Agriculture

August 31, 2015

Mr. J. Clinton Rogers, P.E.
Carollo Engineers
1265 E Fort Union Blvd, Suite 200
Midvale, Utah 84047

Subject: Logan City Wastewater Treatment Environmental Assessment

Dear Mr. Rogers:

The area of the proposed project would impact Statewide Important Farmlands based on the Farmland Protection Policy Act. A 'Farmland Conversion Impact Form' with the Land Evaluation completed by the NRCS is enclosed. If Federal funds are involved, the funding agency completes the Site Assessment as outlined on the form (Parts I, III, VI, VII).

Also enclosed is a WEB Soil Survey report for the area-of-interest.

Please call 801-524-4574 or email mike.domeier@ut.usda.gov if you have any questions or concerns.

Sincerely,

Michael Domeier

MICHAEL DOMEIER
State Soil Scientist

Enclosures

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 21 Aug 15
Name of Project Logan Wastwater Treatment - EA	Federal Agency Involved
Proposed Land Use Water Treatment Plant	County and State Cache County, Utah
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 35 Aug 15	Person Completing Form: Domeier

Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☑ NO ☐	Acres Irrigated 83945	Average Farm Size 207
Major Crop(s) Alfalfa	Farmable Land In Govt. Jurisdiction Acres: 173694 % 23	Amount of Farmland As Defined in FPPA Acres: 13586 % 18	
Name of Land Evaluation System Used Cache County LE	Name of State or Local Site Assessment System Cache LESA Handbook - 2008	Date Land Evaluation Returned by NRCS 31 Aug 15	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly				
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site				
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide Important or Local Important Farmland	49			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted	.0004			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value	70			
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)	75			

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	**Maximum Points**	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)				
2. Perimeter In Non-urban Use	(10)				
3. Percent Of Site Being Farmed	(20)				
4. Protection Provided By State and Local Government	(20)				
5. Distance From Urban Built-up Area	(15)				
6. Distance To Urban Support Services	(15)				
7. Size Of Present Farm Unit Compared To Average	(10)				
8. Creation Of Non-farmable Farmland	(10)				
9. Availability Of Farm Support Services	(5)				
10. On-Farm Investments	(20)				
11. Effects Of Conversion On Farm Support Services	(10)				
12. Compatibility With Existing Agricultural Use	(10)				
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	75	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	0	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	75	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☑ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form:	Date:

(See Instructions on reverse side) **Form AD-1006 (03-02)**

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Cache Valley Area, Parts of Cache and Box Elder Counties, Utah

Logan Wastewater Treatment

August 28, 2015

for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Farmland Classification (Logan City Wastewater Environmental Assessment)

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
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Water Features

Table—Farmland Classification (Logan City Wastewater Environmental Assessment)

Farmland Classification— Summary by Map Unit — Cache Valley Area, Parts of Cache and Box Elder Counties, Utah (UT603)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
Cd	CARDON SILTY CLAY	Farmland of statewide importance	2.9	5.8%
Ck	COLLETT SILTY CLAY LOAM	Farmland of statewide importance	17.2	35.0%
GuA	GREENSON LOAM, DEEP OVER CLAY, 0 TO 1 PERCENT SLOPES	Farmland of statewide importance	20.2	41.0%
Lr	LOGAN SILTY CLAY LOAM	Farmland of statewide importance	8.9	18.1%
Totals for Area of Interest			**49.1**	**100.0%**

Rating Options—Farmland Classification (Logan City Wastewater Environmental Assessment)

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Carollo Engineers

TELEPHONE MEMORANDUM

Route

DATE 8/31/15 TIME 11:05 am PROJECT NO. 8621A10

FROM Bob ~~Fatheringham~~ Fatheringham TO Clint Rogers

OF Cache County TELEPHONE NO. (435) 755-1854

SUBJECT Logan Project

Questions

1) Discharge Point

Where ~~What~~ is the current discharge point and will that continue in the future?

2) Reuse Standard

Any plans for reuse with this water?

Answers

1) Discharge through cow pasture canal will continue. Farmers can use water or it ends up in Swift Slough

2) Water will meet both Az reuse standard and nutrient standards. Farmer reuse can continue and they have water rights. City may have rights to water above which is required for the Farmers. Future projects could include storage in the existing lagoons but no plans currently with this project.

Bridgerland
Audubon
Society

September 10, 2015

J. Clinton Rodgers, P.E.
Carollo Engineers
1265 E. Forth Union Blvd, Suite 200
Midvale,UT 84047

Mr. Rodgers

Bryan Dixon forwarded me a copy of your August 21 letter. Although he is an active member of Bridgerland Audubon Society he is no longer on the board so I would appreciate it if you would copy me in on all future correspondence pertaining to the Logan Wastewater Project. Bridgerland Audubon Society and our nearly 300 members are fully supportive of Logan City and Cache County in their efforts to upgrade the wastewater treatment facility and improve water quality in the Cutler Reservoir and downstream waters. That being said I would like to raise the following questions and concerns. These mainly relate to wildlife habitat concerns and not the technical aspects of the proposed project.

1. What will be done with the existing treatment lagoons and polishing ponds? These currently provide important habitat for thousands of birds and important bird watching opportunities for local and visiting birders.
2. What is the status of the proposed mitigation site? Could some of it be considered wetland now or was it previously used for mitigation? Is the area large enough for this project?
3. Will there be meetings scheduled in Cache County to provide an opportunity for local public input.

Thank you in advance for your response and I look forward to further interactions as this project moves forward.

Sincerely,

Richard Mueller
Conservation Chair
Bridgerland Audubon Society
1526 East 2700 North
North Logan, UT 84341

COLLEGE of AGRICULTURE
UtahStateUniversity

Department of Applied Economics

J. Clinton Rogers, P.E.
Carollo Engineers
1265 E Fort Union Blvd, Suite 200
Midvale, UT 84047

September 11, 2015

Dear Mr. Rogers,

As per Logan City's request that I submit a review of the city's proposed Wastewater Treatment Project (as part of an environmental assessment being performed by the Utah Division of Water Quality (DWQ) pursuant to the National Environmental Policy Act), please accept the following observations concerning what I see as the project's merits. Since I am neither a trained engineer, geographer, nor land-use planner, my observations are premised on what I know of the process that has been followed thus far by the Logan Environment Department (LED) during the planning stages of the project, primarily through discussions with the department's director, Mr. Issa Hamud, and my understanding of the TMDL process through prior involvement with the DWQ and other stakeholders in an EPA-sponsored water quality trading study I was involved with in mid-2000 as the lead economist. Let me begin by sharing my opinions about the TMDL process in general.

Although imperfect, I believe the TMDL process provides the best available information regarding the environmental conditions of the state's water bodies. I also believe that TMDLs are the best available estimates of the limits necessary to achieve EPA standards for these water bodies, which in turn reflect realistic health standards for society, as embodied in the Clean Water Act. Therefore, if a TMDL identifies load reductions necessary to meet EPA standards – which in this particular case concerns total phosphorus and ammonia loadings to the Cutler Reservoir – then I am confident that these reductions are indeed necessary, even though loading measurements to begin with are, by their very nature, imperfect.[1]

Through numerous discussions with Mr. Hamud, as well as my attendance at an informational meeting sponsored by the DWQ and Logan City roughly one year ago (concerning acquisition of state-subsidized loans for construction of the proposed wastewater treatment facility), I am similarly convinced of three things. First, Logan City's existing lagoon treatment system is inadequate to handle both current and projected wastewater flows from the various cities in the valley that jointly use the system and simultaneously meet both the new TMDL and a potentially more-restrictive TMDL in the future. Second, the LED has conducted an exhaustive study of the valley's options with respect to improving its wastewater-treatment capability and capacity. Third, the LED has been similarly assiduous in its pursuit of the most cost-effective option, both in terms of selecting the appropriate technology and geographic location (the latter of which is effectively under USACE jurisdiction) for the treatment facility and in

[1] This imperfection stems from measurement error, which in the case of the Bear River Basin is compounded by the prevalence of non-point source loadings. Imperfection could also stem from the selection of the Cutler Reservoir as the sole receptor point for Cache Valley. But this seems to be a moot point given its geographic significance as a natural collection point in the valley for the Bear River and its tributaries.

4835 Old Main Hill Logan, UT 84322-4835 Ph: (435) 797-3366 Fax: (435) 797-0402

terms of securing the lowest-cost sources of financing. As a result, I strongly believe that the LED and DWQ have done due diligence with respect to each aspect of this project, from selection of the most cost-effective technology and financing sources, to selection of the most appropriate location for the treatment facility, to mitigation of the environmental impacts associated with the selected site.

In closing, I should add that in early-2000 I participated in an LED-sponsored study that involved an assessment of the valley's options forthe siting of a new landfill. This study included detailed geological and landscape studies, as well as thorough financial and community-impact assessments. In the end, it was clear that the LED had done due diligence in studying this issue, and in working both sensibly and scientifically to determine the best available option for the valley's residents. My impression is that the LED is again following a similar process this time regarding selection and siting of a new wastewater treatment facility. I am therefore strongly in support of the proposed wastewater treatment project.

Thank you for soliciting my input,

Arthur J. Caplan
Professor of Economics

carollo engineers

TELEPHONE MEMORANDUM

Route

DATE 9/15/2015 TIME 12:15pm PROJECT NO.

FROM Joseph G Larson TO

OF Newton TELEPHONE NO. 435-757 0647

SUBJECT Logan EA

Received letter but not close enough to be affiliated with the project. Newton is located further north and at a higher elevation. ~~Newton will be~~ Will have no further comment on the project.

W:\FORMS\WCO\PRINTED\TELEMEMO.PRN

Carollo Engineers

TELEPHONE MEMORANDUM

Route

DATE 9/17/15 TIME ______ PROJECT NO. ______

FROM Eve Davies TO ______

OF Pacific Corp TELEPHONE NO. 801-220-2245

SUBJECT

(801) 232 1704 cell

Eve.davies@pacificorp.com

Requesting a copy of the environmental documents available for public review via email.

Email was sent to Eve on 9/18/15

W:\FORMS\WCO\PRINTED\TELEMEMO.PRN

From: Clint Rogers
To: LeeAnn Peterson
Subject: FW: Wastewater Treatment Facility
Date: Monday, September 21, 2015 7:52:29 AM

Please add this to the Logan project comment log.
Thanks,
Clint

-----Original Message-----
From: Peter E Kung [mailto:pekungster@gmail.com]
Sent: Saturday, September 19, 2015 3:51 PM
To: Clint Rogers
Subject: Wastewater Treatment Facility

Clinton Rogers:

I was asked by Jim Harps to comment on Logan's proposed plans to update their current Treatment facility. Quick background to reference my remarks: Farm Boy Upstate NY 20 years; Forty-two year resident of Cache Valley; Owner/Operator of International Biological Consulting and Survey Business 40 years; Logan River Water Users Board member 15 years; Crockett Ave Irrigation Distribution Board 25 years; Logan NW Field Irrigation Board and President 35 years; Bear River / Cutler Advisory Committee 5 years.

Let me begin with it's about time. In the early seventies Logan passed on readily available Federal funds to build a Tertiary Treatment Plant, opting instead to continue trying to dilute the stuff and play the seasonal numbers game. Poor call... Now we've got a bigger costlier problem. We will always have a phosphate problem in Cutler, it's in the sediments (and there's lots) I believe that we should aim for a zero discharge to Cutler. Can't we reuse existing square pond retention infrastructure and area to store and later reuse Wastewater for irrigation returning any remaining phosphate to surrounding Agriculture? Wastewater technology has come a long way baby in the last few years..so let's do it right this time to meet the new parameters and be proactive for Cache Valley's next generations.

The other critical part of your Treatment Plan must include reducing the total produced Wastestream so to speak. Have less Wastewater generated to later treat. For example Institute program of available cheap Low Flow toilets, Ban Garbage Disposals, reduce culinary outside watering and increase watershed irrigation use instead, just to name a few. It will take some hard sell but be worth it in the end.
Remember the push to remove Phosphates from detergents and soap in the late seventies? Took a while but it happened... Nationally!! Let's learn from our mistakes and realize it will take concessions from all parties involved to make compliance happen. Every little bit counts to the whole however

Any Questions about my tirade feel free to contact me. Thanks for asking for my input. Respectfully yours PEK

North Cache Conservation District
1860 North 100 East
North Logan, UT 84341
(435) 753-5616

September 23, 2015

J. Clinton Rogers, P.E.
Carollo Engineers
1265 E. Fort Union Blvd, Suite 200
Midvale, UT 84047

Dear Mr. Rogers,

On behalf of the North Cache Conservation District, we thank you for your work on this vital project and hope that the proposed system serves to meet the required water quality criteria. Our understanding is that the past system did not meet the old water quality standards and we are encouraged that progress is being made to address the issue. The following are our comments regarding this:

1) **The proposed system meets discharge requirements according to established water quality standards.**

   We are not experienced in methods of wastewater treatment but we anticipate that alternatives have been explored and the best, most cost-effective methods have been selected. We do not desire the ineffective performance offered by methods that are not tailored to meet our climatic conditions. Assuming the proposed method is the right choice we applaud the efforts Logan City is making. Please make sure the methods implemented address the need now and are adequate for increased demand in the foreseeable future.

2) **What is the status of the old lagoons?**

   The letter we received discussed piping to connect to the old lagoons and the replacement of existing headworks. We assume this means the existing lagoons are to remain part of the future treatment facility. If this is the case then no concerns are created. If old lagoons are abandoned in the future we would expect restoration be implemented to alleviate weed issues and other environmental concerns caused by abandonment of any of the old lagoon system.

3) **Mitigation site**

   The mitigation site proposed is appropriate and we request that mitigation is carried out responsibly. Weed issues should be addressed quickly and carried out for as long as necessary to ensure establishment of healthy wetland and other desireable vegetation.

Sincerely,

Bracken Henderson
Zone 1 Resource Coordinator

From:	Clint Rogers
To:	LeeAnn Peterson
Subject:	FW: Additional Logan Wastwater Treatment Plant EA comments
Date:	Monday, September 28, 2015 3:59:42 PM
Attachments:	Snto110kmc315091615060.pdf

Please add to the Logan comment log.

From: Davies, Eve [mailto:Eve.Davies@pacificorp.com]
Sent: Monday, September 28, 2015 10:02 AM
To: Clint Rogers
Cc: Davies, Eve; Kolkman, Jack; 'William Damery'
Subject: Additional Logan Wastwater Treatment Plant EA comments

Mr. Rogers-

Thank you for providing electronic versions of the draft Logan City Wastewater Treatment Plant EA and associated documents. Since submitting PacifiCorp's initial comments, I have had a chance to review the draft EA, and have a couple additional minor comments that I would like to add to our previously-submitted comments (attached):

- Please clarify in the introduction to the draft EA the process you are undertaking, with which agency(ies), where in that process Logan City is, what additional comment periods, if any, may be expected, and what the approximate time frames for each additional phase will be;
- The EA noted in the compliance with plans and regulatory acts/laws section, that there were no issues with the Migratory Bird Treat Act, as there was no habitat for migratory birds in the project area; that assertion does not seem consistent with PacifiCorp's experience of the lands in question, and may need to be re-evaluated;
- Similarly, the EA noted there are no issues with the Endangered Species Act given that searches for the Endangered Ute Ladies' Tresses plant, conducted on a single day in July (the 18th), did not identify any such plants—typically, the USFWS requires repeat surveys over multiple years, and during the flowering window as the plants can not reliably be observed outside the flowering window, which occurs after July 18, typically later in August of each year;
- Finally, I could not find in the EA any information discussing the expected life span of the proposed new wastewater treatment plant facilities—how long are the new facilities expected to meet the required water quality standards, both existing and new (such as the new ammonia standard) or potentially foreseeable additional water quality standards? Please add that information to the final EA.

Thank you for the opportunity to comment on the document, and let me know if you have any questions regarding PacifiCorp's comments. Please also confirm that you received our comments when you have the opportunity, and thank you-

Eve Davies

Eve Davies, Principal Scientist
Hydro Resources, PacifiCorp Energy
1407 West North Temple, Ste. 110

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

Hydro Resources Department
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

September 16, 2015

J. Clinton Rogers, P.E.
Carollo Engineers
1265 E. Fort Union Blvd, Suite 200
Midvale, UT
84047

RE: Logan City Wastewater Treatment Environmental Assessment – Request for Comments

Dear Mr. Rogers,

PacifiCorp appreciates the opportunity to comment on Logan City's proposed Wastewater Treatment Project (WWTP) EA. PacifiCorp owns and operates the Cutler Hydroelectric Project and associated lands where effluent from Logan City's facilities is discharged to the Cutler Reservoir. These lands are part of our Federal Energy Regulatory Commission (FERC) Cutler Project, No. 2420. Water quality is an issue that is regulated under our FERC license, and is a matter that PacifiCorp has substantive concerns over as it relates to the environmental health, objectives, and requirements of the entire ~10,000-acre Cutler Project.

Any new treatment project evaluated by this Environmental Assessment process needs to: 1) comply with the new TMDL phosphorus limits and overall objectives; 2) comply with the new ammonia toxicity standard; 3) meet wetland mitigation standards and 404 permit specifications for this project; and, 4) be completed on or before the specified 2020 date. This latest date (several years later than earlier iterations of this process) concerns PacifiCorp as previous steps in the TMDL process had identified earlier dates that have all continued to creep further out into the future. PacifiCorp understands the budgetary constraints of capital-intensive construction projects such as the proposed plant, and that a later construction timeline is favorable from a cost perspective. However, continuing the degradation of the water quality and aquatic habitats in Cutler Reservoir only increases the risk of creating potentially very long term water quality impacts if the system is converted to a toxic blue-green algae system, or alternatively, could maintain such high internal loads (as identified in the Cutler TMDL), that decreasing the phosphorus load in the system to appropriate levels becomes essentially impossible.

Based on the current proposed WWTP construction timeline, PacifiCorp is interested in knowing what if any interim mitigation measures have been identified to address continuing water quality degradation issues at and downstream of Cutler Reservoir? Further, what opportunities are there for incremental or partial implementation that could be initiated prior to final project completion? Please address these questions in your continuing EA process, and also consider annual updates or project status reports to interested parties, including PacifiCorp.

PacifiCorp will continue to monitor the water quality in Cutler Reservoir, per our license conditions, and will continue to actively engage in water quality improvement processes for Cutler in the future. PacifiCorp is concerned with past instances of unauthorized effluent discharges to the Logan River and will continue to advocate to protect the aquatic resources of the Cutler Project. Please ensure that I am included in all future correspondence regarding this project and the referenced EA; we appreciate the opportunity to continue to work with Logan City to protect water quality in Cache Valley.

If you have any questions, please contact me at (801) 220-2245, or via email at Eve.Davies@Pacificorp.com.

Cordially,

Eve Davies

Eve Davies
Principal Scientist

Cc: Jack Kolkman, Plant Director, Hydro Resources
Hydro Document Services

From:	Clint Rogers
To:	LeeAnn Peterson
Subject:	FW: Comment regarding Logan City Wastewater Treatment Environmental Assessment
Date:	Monday, September 28, 2015 3:57:41 PM
Attachments:	Letter to LoganCity RE EA for Tmt Plant.pdf

Please add to the comment log for the Logan project.

From: Summit, Don [mailto:Don.Summit@jbssa.com]
Sent: Monday, September 28, 2015 10:15 AM
To: Clint Rogers
Cc: Issa Hamud (issa.hamud@loganutah.org); Issa Hamud (issahamud@yahoo.com)
Subject: Comment regarding Logan City Wastewater Treatment Environmental Assessment

Dear Mr. Rogers,

I appreciate the opportunity to comment regarding the Logan City Wastewater Treatment Environmental Assessment. Please see my comments in the attached letter. A paper copy is in the mail to you.

Please let me know if you have any questions regarding these comments.

Thanks,
Don

JBS
MAKING YOUR WORLD STRONGER

Don Summit
Hyrum Beef Plant Environmental and Sustainability
don.summit@jbssa.com

O: 435.245.2351
C: 435.881.2404
www.jbssa.com
410 North 200 West
Hyrum, UT 84319

(JBS)

September 12, 2015

J. Clinton Rogers, P.E.
Carollo Engineers
1265 E Fort Union Blvd, Suite 200
Midvale, UT 84047

Subject: Comments Regarding Logan City Wastewater Treatment Environmental Assessment

Dear Mr. Rogers,

Thank you for the opportunity to comment regarding the Environmental Assessment for Logan City's proposed wastewater treatment plant. I have not been involved in the planning of the facility but I was involved in the citizen committee that oversaw the development of the Total Maximum Daily Load (TMDL) report for the Bear River and Cutler Reservoir. It was my opinion, which was shared by others, that the conclusions of the TMDL report were faulty as the science developed for the TMDL study and the data collected at that time did not support the designation that these waters were impaired. Therefore, I withdrew my support for the report at the final citizen committee meeting. It is unfortunate that the TMDL report has been used to drive the requirement for Logan's new treatment plant.

I recommend that you consider possible uses for the existing lagoons as you assess impacts of the new treatment plant. Possible uses for the lagoons would be as equalization basins for runoff or other unusual flows, holding basins for out-of-spec treated effluent waters, holding basins for irrigation reuse water for local farmers and holding basins for discharge of water to the Bear River during low river flows. There may be other uses for the lagoons too. The use as a holding basin for out-of-spec water deserves further explanation. If the new treatment plant does not meet a limit for a short period of time, the water may be held until in-spec water is being produced. The off-spec water can then be blended in while still meeting the limit. Violations can be avoided using this strategy. The other possible uses are self-explanatory.

I understand that Logan City will have a phosphorus limit for its effluent of 1 ppm and no nitrogen limit. However, a nitrogen limit will surely come in time. Therefore, I recommend that the treatment plant be designed with future nitrogen limits in mind.

If you have questions regarding these comments, please let me know. I can be reached at (435) 245-2351.

Sincerely,

G. Don Summit

G. Don Summit, PhD, P.E.
Environmental Manager

From:	Clint Rogers
To:	LeeAnn Peterson
Subject:	FW: Logan City WWTF EA comments
Date:	Monday, September 28, 2015 4:00:49 PM
Attachments:	Attachment information LetterLoganCityWWTF_EA20150928.pdf

Please add to the Logan comment log.

-----Original Message-----
From: Bryan Dixon [mailto:bdixon@xmission.com]
Sent: Monday, September 28, 2015 2:27 PM
To: Clint Rogers
Cc: William Damery
Subject: Logan City WWTF EA comments

Mr. Rogers,

Please find attached my comments on the draft EA for the Logan City WWTF. I look forward to these issues being addressed.

Thank you.

Bryan Dixon

Bryan Dixon
10 Heritage Cove
Logan, UT 84321
435-760-0691

W. Bryan Dixon
10 Heritage Cove
Logan, UT 84321-3300
C: 435-760-0691
bdixon@xmission.com

September 28, 2015

Logan Environmental Department
153 North 1400 West
Logan, UT 84321

To Whom It May Concern:

I appreciate the opportunity to comment on the Environmental Assessment for improvements to the Logan City Wastewater Treatment Facilities. I served on the TMDL Advisory Committee for the Cutler Reservoir TMDL and I applaud the City making progress, however delayed, on curbing its pollution to the nation's waters. Specific comments follow:

1. Table 1: Existing and Future Effluent Limits for Phosphorus: Even though there may have been no legal limits on P in the past, it would have been helpful to know what the existing discharge of P was.
2. Figure 2a: Where is the RAS/WAS building to be located? (Perhaps it is the un-labeled rectangle between the secondary clarifiers?) Where is the clarifier splitter box?
3. Section 3.5
    a. Threatened and Endangered Species: A survey for Ute ladies'-tresses (Spiranthes diluvialis) cannot reliably find plants if conducted in July. ULTs are found on widely separated parcels of private property approximately 4 miles away, along the Mendon Road and on lands owned by the Bear River Land Conservancy. Approximately 1,100 plants were found on these properties in 2014, but they do not bloom every year, are only reliably locatable when they are blooming, and they do not start blooming until very late in July, and into August. No comprehensive surveys for ULTs have been conducted in Cache Valley in prime blooming periods. The proposed site appears to have wet meadow habitat, the ideal habitat for ULTs.
    b. Wildlife and Vegetation: Page 16: "A review of wildlife data from the UNHP database did not indicate the presence of any state sensitive species in the study area." Contrary to this report, there are several Utah species of concern that occur in the area, though this project would probably not have a significant impact on them. Contractors should consult other, more modern, sources of data; e.g., eBird, Christmas Bird Count records. Notes from local sources on avian species in area:

Utah Species of Concern for Cache County in Project Area		
Common Name	**Scientific Name**	**Notes**
American white pelican	*Pelecanus erythrorhynchos*	Common on open water in vicinity of project
Bald eagle	*Haliaeetus leucocephalus*	Wetlands in vicinity serve as winter roosting areas
Bobolink	*Dolichonyx oryzivorus*	Breeding populations along 3200 West and fields at corner of 1900 West and 600 South
Ferruginous hawk	*Buteo regalis*	Found north of the project in winter (probably not found in project site)
Long-billed curlew	*Numenius americanus*	Breeding populations in areas west of Cutler Reservoir; probably not breed in project area due to dense human activity
Short-eared owl	*Asio flammeus*	Small populations found in various places north of project area

4. 3.7 Wetlands and Waters of the U.S.:
   a. You cannot rely on a simple observation of wetland-associated plants to determine wetland impacts. A formal wetland delineation should be conducted.
   b. Given Logan City's past performance, impacts on approximately 10+ acres of wetlands and water cannot reasonably be mitigated on only 13.5 acres. Mitigation of at least 2:1 should be required. Where will the balance of the mitigation take place?
   c. Figure 7: Proposed Wetland Mitigation shows in green cross-hatching a "Proposed Wetland Mitigation Site," but this area is already a wetland. Is there some other portion of the Logan-owned area in this figure that will be used for mitigation?
5. 3.16 Compliance with Environmental Laws and Regulations--Migratory Bird Treaty Act (15 U.S.C. 701-18H). The report states "*Compliance: This act requires that the project avoid destruction of active bird nests or the young of migratory birds that breed in the area from March to August. There is no suitable nesting habitat for migratory birds in the study area. Migratory birds are attracted to the existing lagoons for resting places. The project will retain at least some of the existing lagoons. As a result, the project is not expected to have any adverse effect on migratory birds.*" There is almost certainly some nesting habitat in the project for migratory birds covered by the MBTA, including Killdeer, various songbirds, etc. Further, there is no estimate of the amount or proposed functionality of the exiting sewage lagoons that will be retained. Impacts on open water characteristics (i.e., ice-free in winter) of these retained lagoons will be critical, as many thousands of ducks, geese, and other waterbirds, as well as Bald Eagles, falcons, and other predators rely on these waters.

In addition, as expressed in a previous letter, I have some general concerns:

1. Which of Logan City's past mitigation projects west of the landfill have been successful, which are late in meeting their performance requirements, and which have failed to meet their scheduled targets?
2. Will a bond be required to ensure Logan City completes the project on schedule? Their history, particularly that of the City's Environmental Department Director, is one of denial

first, then grossly exaggerated statements about costs for individual households, and then begging the Division of Water Quality for special dispensation. I fear some instrument will be necessary to force compliance within a reasonable schedule.

I look forward to these issues being addressed.

Sincerely,

W. Bryan Dixon

Bryan Dixon

cc by email:
Clinton Rogers, Carollo Engineers
William Damery, UDWQ

Judy Imlay

From: Clint Rogers <CRogers@carollo.com>
Sent: Friday, October 30, 2015 5:15 PM
To: richard.mueller@usu.edu
Cc: Tyler Richards (tyler.richards@loganutah.org); Judy Imlay
Subject: Proposed Logan Wastewater Project

Mr. Mueller,
I'm working with Logan City and the Utah Division of Water Quality (UDWQ) to formally address all comments received regarding the proposed Logan City Wastewater Treatment Project. Our formal response is pending, but I did want to let you know about upcoming public comment opportunities.

- The project plan is up for approval by the Logan City Council as part of their regular city council meeting on Nov 3rd at 5:30pm.
- Also, the UDWQ will have a 30 day public comment period prior to approval of the environmental assessment conducted for the proposed project site. This 30 day public comment period will likely begin in the mid to later part of November 2015.

We appreciate your interest in the project, let me know if you have any additional questions.
Clint

Clint Rogers, P.E.
Vice President/Project Manager
Carollo Engineers, Inc.
1265 E Fort Union Blvd, Suite 200
Salt Lake City, UT 84047
P: 801-233-2519
M: 801-680-4468
www.carollo.com

LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

November 3, 2015

Arthur J. Caplan
Utah State University
4835 Old Main Hill
Logan UT 84322-4835

Re: Logan Wastewater Treatment Facility
Response to Comment

Dear Mr. Caplan,

Thank you for your comment and your support for the proposed project. Your involvement and commitment to improving water quality in Cache Valley is duly noted and appreciated.

The Clean Water Act requires every state to establish and maintain water quality standards designed to protect, restore, and preserve water quality in the state. These standards consist of narrative criteria that include designated uses, specific chemical and biological criteria necessary for protecting designated uses, and an anti-degradation policy. When a lake, river or stream fails to meet water quality standards, section 303(d) of the Clean Water Act directs the state to place the waterbody on a list of "impaired" waters referred to as the 303(d) list and prepare a plan to restore water quality called a Total Maximum Daily Load study (TMDL). The TMDL report is an approved TMDL and Logan City is therefore required to meet the requirements set forth in it.

As you have acknowledged, the existing facilities in Logan are in need of improvements to address the current deficiencies in meeting the existing TMDL and the future issues with more restrictive TMDL standards, while still being able to handle the current and projected wastewater flows. As set forth in the document, Logan City has done extensive analysis to try to determine the most effective methodology to address the current and future wastewater issues facing Cache Valley. The Logan City Wastewater Treatment Master Plan section titled "Evaluation Alternatives" outlines the four main treatment alternatives and provides cost estimates for all. The preferred treatment alternative is also the least expensive option.

We hope this response adequately addresses the concerns you have related to the proposed project.

Sincerely,

Jim Harps
Wastewater Treatment Manager
Cc:

November 3, 2015

Eve Davies
Principal Scientist
Hydro Resources, PacifiCorp Energy
1407 W North Temple, Ste 110
Salt Lake City, UT 84116

RE: Logan Wastewater Treatment Facility Project
Response to Comments

Dear Ms. Davies,

Thank you for your continuing interest in the proposed project and for your comments. In response to your comments, the project team offers the following responses:

You expressed concern about potential impacts to migratory birds as a result of the proposed project. The EA specified that migratory birds are attracted to the existing lagoons; however, no suitable nesting habitat was identified during the presence/absence survey conducted in connection with this project. The Migratory Bird Treaty Act specifically prohibits anyone to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird." (16 U.S.C. 703). It does not address the reduction in suitable nesting habitat. Therefore, the project would not run afoul of the Migratory Bird Treaty Act, even if all of the existing lagoons were removed. Further, construction crews would be advised as to the restrictions of the Migratory Bird Treaty Act so as to not violate its provisions during construction, should any migratory birds or nests be discovered.

In regards to the potential for the site to contain ULT plants, the wetland delineation study conducted in 2012 by White Horse Associates reported no evidence of ULTs during the study. The plant species list provided by the Utah Natural Heritage Program (from their historic occurrences database) in Appendix C of the study contained no record of ULTs. Further, as indicated in the EA, an onsite assessment of plant species conducted in 2013 by Horrocks Engineers reported no ESA species within or adjacent to the study. While the survey was conducted outside of the flowering window, the project area was determined to be less-than-ideal habitat based upon the insufficient hydrological conditions, as well as the historical level of disturbance from grazing and agricultural activities which is incompatible with the growth of ULT individuals. The EA has been updated to reflect a no effect determination for ULTs.

In regards to the anticipated lifespan of the new facility, the Logan City Wastewater Treatment Master Plan section titled "Treatment Requirements" outlines the existing and potential future nutrient limits (total nitrogen to 10 mg/L) and is designed to achieve these limits until 2040.

The Logan City Wastewater Treatment Facility project is designed to comply with the new TMDL phosphorus limits and the new ammonia toxicity standard. As part of the project, Logan City will comply with USACE requirements under the Section 404 permit, including the wetland mitigation standards. An updated compliance schedule for the project was provided in the July 2015 permit issues by the Utah Division of Water Quality (UDWQ) and has been included in the EA. The compliance schedule includes the following information:

- By December 31, 2016, Logan City shall submit detailed construction plans and specifications to UDWQ to obtain a construction permit.
- By June 30, 2017, Logan City shall commence construction of approved wastewater treatment upgrades as outlined in the UDWQ construction permit.
- By July 31, 2020, Logan City shall complete construction of wastewater treatment upgrades and begin startup and optimization of upgraded wastewater treatment processes.
- By January 1, 2021, Logan City shall achieve compliance with all effluent limits prescribed in UPDES Permit #UT0021920, including al new phosphorus and ammonia effluent limits. The final phosphorus limits from Outfall 002 shall be 4,405 kg total phosphorus from May through October and 11,831 kg total phosphorus from November through April. If Logan City decides to abandon the treatment wetlands and move its discharge point to Outfall 001A and Outfall 001B, then the final phosphorus limits from those outfalls shall be a combined total of 11,487 kg from May through October and 12,907 kg from November through April. Final ammonia limits shall be 30 Day Average of 3.0 mg/L in Winter and Spring, 1.3 mg/L in Summer and 2.3 mg/L in Fall. The Daily Maximum shall be 5.0 mg/L in Winter, 8.0 mg/L in Spring. 6.0 mg/L in Summer and 7.0 mg/L in Fall.

The proposed facility has been designed to meet all of new standards for ammonia and phosphates. Any additional improvements in the future to the facility would look at addressing the concerns of additional flow and the possibility of including facilities to allow for potential energy development.

We hope this response adequately addresses the concerns you have related to the proposed project.

Sincerely,

Jim Harps
Wastewater Treatment Manager

cc:

November 3, 2015

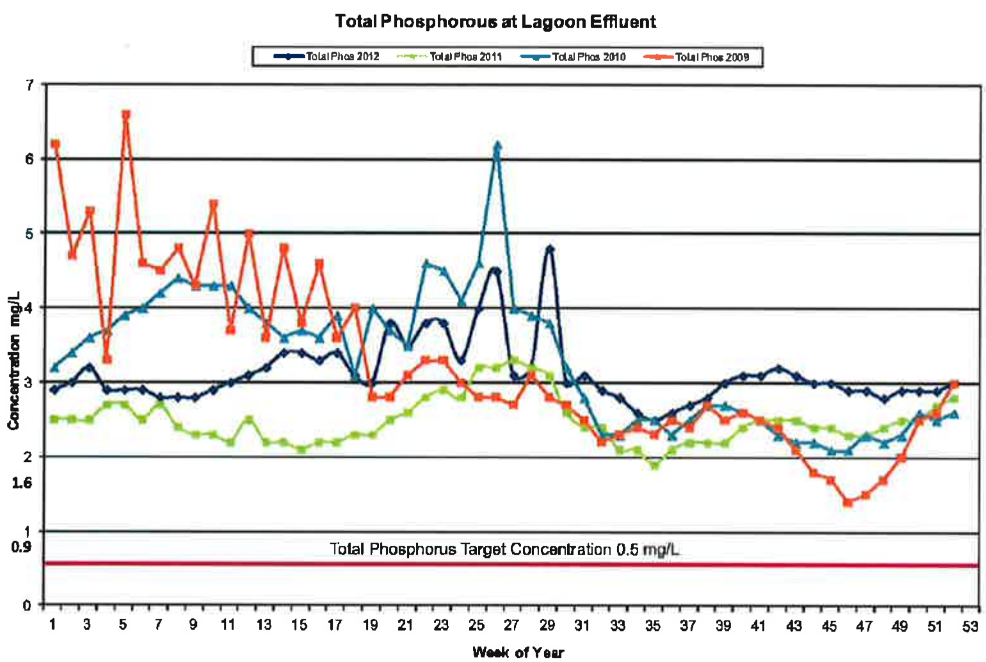
Bryan Dixon
10 Heritage Cove
Logan, Utah 84321-3300

Re: Logan Wastewater Treatment Facilities Project
Response to Comment

Dear Mr. Dixon,

Thank you for your comments. Logan City addresses your specific comments as follows:

Existing Phosphorus Discharge: In response to your question about existing phosphorus discharge, the following graphic has been included in the E



Certain Facilities: In regards to your question regarding the location of certain buildings, the proposed location of the RAS/WAS building is identified on Figure 2 in the EA as No. 7 and the clarifier splitter box is identified as No. 5.

Threatened and Endangered Species: In regards to the potential for the site to contain ULT plants, the wetland delineation study conducted in 2012 by White Horse Associates reported no evidence of ULTs during the study. The plant species list provided by the Utah Natural Heritage Program (from their historic occurrences database) in Appendix C of the study contained no record of ULTs. Further, as indicated in the EA, an onsite assessment of plant species conducted in 2013 by Horrocks Engineers reported no ESA species within or adjacent to the study. While the survey was conducted outside of the flowering window, the project area was determined to be less-than-ideal habitat based upon the insufficient hydrological conditions, as well as the historical level of disturbance from grazing and agricultural activities which is incompatible with the growth of ULT individuals.

Wildlife Species: For wildlife species, several data sources accepted as official sources by government agencies with jurisdiction over this issue were consulted in regards to historic presence/absence, including consultation with the U.S. Fish and Wildlife Service and the Utah Division of Wildlife Resources, as well as data obtained from the Utah Natural Heritage Program (UNHP) historic occurrence database and the USFWS Information Planning and Conservation (IPaC) website. While there may be other sources of anecdotal data regarding wildlife species available, only officially recognized data sources were utilized in connection with this project.

This consultation used specific, project-related information to determine the potential for wildlife species to be present in the project area itself. The data reviewed included the list of state-sensitive species maintained by the Utah Division of Wildlife Resources, which includes most of the bird species you listed (as well as other non-avian species). A presence/absence survey was conducted in connection with this project and suitable habitat for the species you listed was not found within the project area.

Wetlands: A formal wetland delineation was conducted in connection with this project for the impact site, which documented certain wetlands (see Table 8. Wetlands Identified in the Project Area). This delineation has been reviewed by the US Army Corps of Engineers (USACE) and a jurisdictional determination has been made. Logan City prepared a proposed mitigation plan to address the impacts and is currently in consultation with the USACE to determine whether it is sufficient. The decision as to how much and what kind of mitigation is required falls under the jurisdiction of the USACE, as well as any enforcement measures for failure to comply with approved mitigation plans.

Migratory Birds: The EA specified that migratory birds are attracted to the existing lagoons; however, no suitable nesting habitat was identified during the presence/absence survey conducted in connection with this project. The Migratory Bird Treaty Act specifically prohibits anyone to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird." (16 U.S.C. 703). It does not address the reduction in suitable nesting habitat. Therefore, the project would not run afoul of the Migratory Bird Treaty Act, even if all of the existing lagoons were removed. Further, construction crews would be advised as to the restrictions of the Migratory Bird Treaty Act so as to not violate its provisions during construction, should any migratory birds or nests be discovered. The project area is in relatively close proximity to the Cutler Reservoir which provides alternative suitable habitat.

General: As for your general concerns, Logan City is currently working with the U.S. Army Corps of Engineers (USACE) to determine the appropriate mitigation measures for wetland impacts and will abide by all conditions set by the USACE and all other regulatory agencies, as well as for all other mitigation commitments contained in the EA.

Also, an updated compliance schedule for the project was provided in the July 2015 permit issues by the Utah Division of Water Quality (UDWQ) and has been included in the EA. The compliance schedule includes the following information:

- By December 31, 2016, Logan City shall submit detailed construction plans and specifications to UDWQ to obtain a construction permit.
- By June 30, 2017, Logan City shall commence construction of approved wastewater treatment upgrades as outlined in the UDWQ construction permit.
- By July 31, 2020, Logan City shall complete construction of wastewater treatment upgrades and begin startup and optimization of upgraded wastewater treatment processes.

By January 1, 2021, Logan City shall achieve compliance with all effluent limits prescribed in UPDES Permit #UT0021920, including al new phosphorus and ammonia effluent limits. The final phosphorus limits from Outfall 002 shall be 4,405 kg total phosphorus from May through October and 11,831 kg total phosphorus from November through April. If Logan City decides to abandon the treatment wetlands and move its discharge point to Outfall 001A and Outfall 001B, then the final phosphorus limits from those outfalls shall be a combined total of 11,487 kg from May through October and 12,907 kg from November through April. Final ammonia limits shall be 30 Day Average of 3.0 mg/L in Winter and Spring, 1.3 mg/L in Summer and 2.3 mg/L in Fall. The Daily Maximum shall be 5.0 mg/L in Winter, 8.0 mg/L in Spring. 6.0 mg/L in Summer and 7.0 mg/L in Fall.

We hope this response adequately addresses the concerns you have related to the proposed project.

Sincerely,

Jim Harps
Wastewater Treatment Manager

cc:

November 3, 2015

Betsy Hermann
U.S. Fish and Wildlife Service
Utah Ecological Services Field Office
2369 W. Orton Circle, Suite 50
West Valley City, UT 84119

Re: Logan Wastewater Treatment Facility Project
Response to Comment

Dear Ms. Hermann,

We are in receipt of your comment with regards to the proposed project. We have requested and received an official species list using the USFWS Information Planning and Conservation (IPaC) website and have updated our Threatened and Endangered Species Effect Determination to reflect the updated information, attached.

In regards to your concern regarding Ute ladies'-tresses (ULTs), the project area has been adequately surveyed for suitable habitat for ULT. The wetland delineation study conducted in 2012 by White Horse Associates reported no evidence of ULTs during the study. The plant species list provided by the Utah Natural Heritage Program (from their historic occurrences database) in Appendix C of the study contained no record of ULTs. Further, as indicated in the EA, an onsite assessment of plant species conducted in 2013 by Horrocks Engineers reported no ESA species within or adjacent to the study. While the survey was conducted outside of the flowering window, the project area was determined to be less-than-ideal habitat based upon the insufficient hydrological conditions, as well as the historical level of disturbance from grazing and agricultural activities which is incompatible with the growth of ULT individuals. The EA has been updated to reflect a no effect determination for ULTs.

We hope this response adequately addresses the concerns you have related to the proposed project.

Sincerely,

Jim Harps
Wastewater Treatment Manager

cc:

LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

November 3, 2015

Peter E. Kung
SENT VIA EMAIL TO pekungster@gmail.com

Re: Logan Wastewater Treatment Facility
Response to Comment

Dear Mr. Kung,

Thank you for your comment. Logan City recognizes the need for this project, as well as for the need to reduce the future generation of wastewater. However, your suggestion about taking action to reduce the current and future generation of wastewater are beyond the scope of this project and such measures are therefore not analyzed in the document.

In response to your question concerning the reuse of the retention pond infrastructure, although not a part of this project, future plans could include pumping treated water for winter storage and summer land application. See the section titled *Reuse* in Chapter 4 of Logan City WWTMP.

We hope this response adequately addresses the concerns you have related to the proposed project.

Sincerely,

Jim Harps
Wastewater Treatment Manager

cc:

November 3, 2015

Richard Mueller
Conservation Chair
Bridgerland Audobon Society
1526 East 2700 North
North Logan, UT 84341

Dear Mr. Mueller

Thank you for your comment. Your input on Logan City's (City) proposed wastewater treatment project is appreciated. To answer your questions, the project team provides the following:

The proposed project will use a portion of the existing lagoons to equalize and store sewer system peak flows prior to treatment through the new mechanical treatment facility. The remaining portion of the lagoons will stay in place and full of water. The proposed project does not include funding for decommissioning or repurposing the lagoons other than conveyance modifications for storage of peak flows. Future City planning and projects will have to decide the ultimate fate of the existing lagoon system.

The proposed project will impact wetlands and requires mitigation. The City has applied for a permit with the U.S. Army Corps of Engineers (USACE) and submitted a mitigation plan to address the impacts. The proposed mitigation site is on City owned property located south of the existing lagoon system and west of the existing landfill. The proposed site is of sufficient size for the mitigation plan and is adjacent to existing mitigation areas creating an overall area of wetland habitat that USACE staff viewed as beneficial. The City will construct and maintain the mitigation site in accordance with USACE requirements.

As to your question concerning additional public involvement activities, the proposed project will be discussed at a Logan City Council meeting on November 3, 2015. Further, when the Environmental Assessment (EA) currently being prepared under the direction of the Utah Division of Water Resources (USWR) is completed and approved for public release, a public hearing will be held by the UDWR, at which point public input into the EA will be solicited.

All public comments received and responses sent out in reply to public comments will be included in the EA as part of the public record for the project.

Sincerely

Jim Harps

Wastewater Treatment Manager

LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

November 3, 2015

Bracken Henderson
Resource Coordinator
North Cache Conservation District
1860 North 100 East
North Logan, UT 84341

RE: Logan Wastewater Treatment Facility Project
Response to Comment

Dear Mr. Henderson,

Thank you for your comment. Your involvement and commitment to improving water quality in Cache Valley is duly noted and appreciated.

The Clean Water Act requires every state to establish and maintain water quality standards designed to protect, restore, and preserve water quality in the state. These standards consist of narrative criteria that include designated uses, specific chemical and biological criteria necessary for protecting designated uses, and an anti-degradation policy. When a lake, river or stream fails to meet water quality standards, section 303(d) of the Clean Water Act directs the state to place the waterbody on a list of "impaired" waters referred to as the 303(d) list and prepare a plan to restore water quality called a Total Maximum Daily Load study (TMDL). The TMDL report is an approved TMDL and Logan City is therefore required to meet the requirements set forth in it.

The existing facilities in Logan are in need of improvements to address the current deficiencies in meeting the existing TMDL and the future issues with more restrictive TMDL standards, while still being able to handle the current and projected wastewater flows. As set forth in the document, Logan City has done extensive analysis to try to determine the most effective methodology to address the current and future wastewater issues facing Cache Valley. The Logan City Wastewater Treatment Master Plan section titled "Evaluation Alternatives" outlines the four main treatment alternatives and provides cost estimates for all. The preferred treatment alternative is also the least expensive option.

As set forth in the document, Logan City has done extensive analysis to try to determine the most effective methodology to address the current and future wastewater issues facing Cache Valley. The Logan City Wastewater Treatment Master Plan section titled "Evaluation Alternatives" outlines the four main treatment alternatives and provides cost estimates for all. The preferred treatment alternative is also the least expensive option.

In regard to the existing lagoons, at least some of the existing treatment lagoon and polishing ponds would remain in place. Current plans for those lagoon ponds not being utilized as part of this project include leaving them in place and continue to hold water, potentially for irrigation water in the future. At this point, the proposed project does not address abandoning the lagoons or what uses they may be put to in future.

153 North 1400 West Logan, Utah 84321-6964 • ph: 435.716.9755 • fx: 435.716.9751 environmental.loganutah.org

The proposed project would impact wetlands, which would require mitigation. Logan City has prepared a proposed mitigation plan to address the impacts and is currently in consultation with the U.S. Army Corps of Engineers (USACE) to determine whether it is sufficient or what changes or alterations would need to be made to the plan. The decision as to how much and what kind of mitigation is required falls under the jurisdiction of the USACE, as well as any enforcement measures for failure to comply with approved mitigation plans. Logan City will of course comply with all conditions set by the USACE.

We hope this response adequately addresses the concerns you have related to the proposed project.

Sincerely,

Jim Harps
Wastewater Treatment Manager

cc:

LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

November 3, 2015

Don Summit
JBS
410 North 200 West
Hyrum, UT 84319

Re: Logan Wastewater Treatment Facility Project
Response to Comment

Dear Mr. Summit,

Thank you for your comment and your interest in the proposed project. In regards to your concerns, the project team offers the following information:

The Clean Water Act requires every state to establish and maintain water quality standards designed to protect, restore, and preserve water quality in the state. These standards consist of narrative criteria that include designated uses, specific chemical and biological criteria necessary for protecting designated uses, and an anti-degradation policy. When a lake, river or stream fails to meet water quality standards, Section 303(d) of the Clean Water Act directs the state to place the waterbody on a list of "impaired" waters referred to as the 303(d) list and prepare a plan to restore water quality called a Total Maximum Daily Load study (TMDL). The TMDL report is an approved TMDL and Logan City is therefore required to meet the requirements set forth in it.

At least some of the existing treatment lagoon and polishing ponds would remain in place. Water will meet both the reuse standard and nutrient standards. Farmer reuse can continue and they would continue to have water rights. The City may have rights to water above that which is required for the farmers. Future projects could include storage in the existing lagoons but no plans currently with this project. See section titled *Reuse* in Chapter 4 of Logan City WWTMP.

In regards to nitrogen levels, the Logan City Wastewater Treatment Master Plan section titled "Treatment Requirements" outlines the existing and potential future nutrient limits (total nitrogen to 10 mg/L) and is designed to achieve these limits until 2040.

We hope this response adequately addresses the concerns you have related to the proposed project.

Sincerely,

Jim Harps
Wastewater Treatment Manager

cc:

Judy Imlay

From:	Clint Rogers <CRogers@carollo.com>
Sent:	Tuesday, November 03, 2015 3:37 PM
To:	Judy Imlay
Subject:	FW: Letter of Response to Comment
Attachments:	Letter of Response.pdf

From: Jim Harps [mailto:jim.harps@loganutah.org]
Sent: Tuesday, November 3, 2015 3:33 PM
To: pekungster@gmail.com
Cc: Clint Rogers
Subject: Letter of Response to Comment

Mr Kung,

Please find the attached letter of response to your comment submitted regarding the proposed Logan Wastewater Treatment Facility project.

Thanks,

Jim

--

Jim Harps
Wastewater Treatment Manager
City of Logan

LOGAN
CITY UNITED IN SERVICE
ENVIRONMENTAL DEPARTMENT

November 3, 2015

Peter E. Kung
SENT VIA EMAIL TO pekungster@gmail.com

Re: Logan Wastewater Treatment Facility
Response to Comment

Dear Mr. Kung,

Thank you for your comment. Logan City recognizes the need for this project, as well as for the need to reduce the future generation of wastewater. However, your suggestion about taking action to reduce the current and future generation of wastewater are beyond the scope of this project and such measures are therefore not analyzed in the document.

In response to your question concerning the reuse of the retention pond infrastructure, although not a part of this project, future plans could include pumping treated water for winter storage and summer land application. See the section titled *Reuse* in Chapter 4 of Logan City WWTMP.

We hope this response adequately addresses the concerns you have related to the proposed project.

Sincerely,

Jim Harps
Wastewater Treatment Manager

cc:

Civil

PROOF OF PUBLICATION

STATE OF UTAH
COUNTY OF CACHE, ss

On this 3rd day of September, A.D. 2015 personally appeared before me JAIME MAW who being first being duly sworn, deposes and says that (s)he is the Principal Legal Clerk of the Cache Valley Publishing Co., publishers of The Herald Journal a daily newspaper published in Logan City, Cache County Utah, and that the Legal Notice, a copy of which is hereto attached was published in said newspaper for 6 issue(s) and that said notice also published on utahlegals.com on the same days(s) as publication in said newspaper

Commencing on the following days:
08/28/2015 08/29/2015 08/30/2015 09/01/2015 09/02/2015 09/03/2015

________________________, Principal Legal Clerk

Subscribed and sworn to before me on this3rd day of September, A.D. 2015

________________________,Notary Public
Commissioned in the State of Utah
My Commission expires 10/18/2015

NOTARY PUBLIC
LAURIE JACKSON
My Commission # 649375
My Commission Expires
October 18, 2015
STATE OF UTAH

LEGAL NOTICE

The following information is a Legal Notice from the City of Logan Environmental Department.

Logan City, in cooperation with the Utah Division of Water Quality (DWQ) is initiating an Environmental Assessment for a proposed Wastewater Treatment Project in Logan City, Cache County, Utah. The Environmental Assessment is being performed pursuant to the requirements of the National Environmental Policy Act (NEPA) for the State of Utah Division of Water Quality (DWQ).

Logan City respectfully requests Public input for the review of the proposed project in order to identify potential resources, concerns, requirements, or recommendations that you may have relating to the proposed project. The period for public input will begin August 28, 2015 and will run for 30 days.

Copies of the documents associated with this project may be viewed at the Logan Environmental Department building (153 North 1400 West) or at the Logan City Library (255 North Main). These documents include: Wetland Mitigation and Monitoring Plan, the Wastewater Treatment Master Plan, Phase I Environmental Assessment, Archeological Resource Investigation, and draft Environmental Assessment.

For more information please contact (435) 716-9797.

Jim Harps
Wastewater Treatment Manager
City of Logan

Publication Date: August 28, 29, 30, September 1, 2 and 3, 2015

New wastewater environmental study open for public comment

Katie Peikes staff writer (https://news-dot-hjnews-dot-com.bloxcms.com/users/profile/Katie Peikes) Sep 24, 2015

A study on the land where a new wastewater treatment facility will be installed shows results of no significant impacts from implementing the project, and the Logan Environmental Department announced the public comment period will run through Sept. 28.

While there will be no significant impact, Environmental Department Director Issa Hamud said the project will yield an impact on the environment.

"There is some," he said. "We have some wetlands on the ground right now. We're going to have to move those wetlands to a different location."

The plan to install a new wastewater treatment plant south of the existing lagoons which are on the west side of Logan, north of State Road 30, has been in consideration for over 10 years.

"Our existing facility is an old treatment facility called a lagoon system," Hamud said. "The state has a new quality (stipulation) ... more restrictive than the old ones, and our facility cannot meet those more restrictive standards of water quality with what we have now."

Federal and state agencies released stricter standards regarding the allowed amounts of phosphorus and nitrogen in discharged, treated water several years ago, prompting the need for the new facility.

Hamud said the expectation is for the new treatment plant to exceed the lifespan of the current one, which has been active since the 1960s. He anticipates construction of the new wastewater treatment plant to start in 2017. The hope is that it will be completed by 2020.

A public comment submitted earlier this month reflected on the lagoon treatment system's inability to handle all wastewater, increasing the need for a new facility.

The commenter, USU economics professor Arthur Caplan, praised the environmental department for looking at the valley's options through an extensive study and for pursuing cost-effective options so far.

Additionally, Caplan mentioned his participation in a previous study, when the environmental department assessed the valley's options for situating a new landfill in the early 2000s, and his hopes for how the new wastewater facility will yield the same results.

"In the end, it was clear that the LED (Logan Environmental Department) had done due diligence in studying this issue, and in working both sensibly and scientifically to determine the best available options for the valley's residents," he wrote, regarding the landfill. "My impression is that the LED is again following a similar process this time regarding selection and siting of a new wastewater treatment facility. I am therefore strongly in support of the proposed wastewater treatment project."

Residents can submit comments on the study by sending it to the Logan Environmental Department at 153 N. 1400 West now through Sept. 28. If comments arrive after, Hamud said the city will forward them to the state, which will be reviewing the environmental study prior to the start of construction.

Copies of documents pertaining to the draft of the environmental assessment can be found at the Logan Environmental Department or the Logan Library, 255 N. Main St. Residents can view documents on the Wetland Mitigation and Monitoring Plan, the Wastewater Treatment Master Plan, Phase I Environmental Assessment and Archeological Resource Investigation.

LOGAN CITY COUNCIL MEETINGS

Minutes of the meeting of the Logan Municipal Council convened in regular session on Tuesday, March 6, 2012 at 5:30 p.m. in the Logan City Municipal Council Chamber, 290 North 100 West, Logan, Utah. Chairman Dean Quayle conducting.

Council members present at the beginning of the meeting: Chairman Dean Quayle, Vice Chairman Holly Daines, Karl B. Ward, Herm Olsen and Tom Jensen (present electronically by telephone). Administration present: Mayor Randy Watts, City Attorney Kymber Housley, Finance Director Richard Anderson and City Recorder Teresa Harris.

OPENING CEREMONY

Pastor Paul Heins from the First Presbyterian Church gave the opening thought, prayer and led the audience in the pledge of allegiance

Chairman Quayle welcomed those present. There were approximately 24 citizens in the audience at the beginning of the meeting.

Meeting Minutes. Minutes of the Council meeting from February 21, 2012 were reviewed and approved with minor changes.

Meeting Agenda. Chairman Quayle announced at tonight's meeting there would be three public hearings.

Meeting Schedule. Chairman Quayle announced that regular council meetings would be held the first and third Tuesdays of the month at 5:30 p.m. The next regular council meeting is Tuesday, March 20, 2012.

QUESTIONS AND COMMENTS FOR MAYOR AND COUNCIL.

Attorney Nathan Hult addressed the Council regarding an appeal of park strip reclamation. He represents appellants Gutke Hult Properties (Law Offices), St. John's Episcopal Church, Citrus and Sage, Sunrise Cyclery and Le Nonne's all of which are located in the area of 110 North 100 East. He distributed a summary of arguments in support of a request for the City Council appeal hearing. He highlighted Logan City Resolution 08-24 that approved "Supporting Park Strip Regulation and Enforcement" on May 13, 2008. He feels the plan does not designate what a park strip is exactly. The appellants feel this is public parking and not private. They believe that these facts and issues are sufficient for the City Council to conclude that an exception could be justified and it should therefore grant them an appeal hearing.

Dr. Myron Guymon addressed the Council. His business is located at 191 North 200 East. He appeals for a hearing on the nature that he has anywhere from 60 to 80 patients, most of which are adolescents coming into his business each day and not having off street parking is a safety concern. He feels the parking was there as a contingency when the building was built and the parking has been in place for over 50 years. He has maintained the building and does not want his patients crossing 100 East. He respectfully requests a hearing.

Councilmember Olsen stated there might not be enough interest on the Council for a hearing but he is sympathetic to these parking concerns and there is a historical component that he feels is worth reviewing.

MAYOR/ STAFF REPORTS.

Board Appointments – Mayor Randy Watts.

Mayor Watts asked the Council for ratification of Fred Duersch and Doug Raymond to serve on the Board of Adjustment (reappointments) which are five year terms.

ACTION. Motion by Councilmember Daines seconded by Councilmember Ward to approve ratification of Fred Duersch and Doug Raymond as presented. Motion carried by roll call vote.
Ward: yes
Daines: yes
Quayle: yes
Olsen: yes
Jensen: yes

Mayor Watts asked the Council for ratification of Clair Griffin to serve on the Board of Adjustment (new appointment) which is a five year term.

ACTION. Motion by Councilmember Daines seconded by Councilmember Ward to approve ratification of Clair Griffin as presented. Motion carried by roll call vote.
Ward: yes
Daines: yes
Quayle: yes
Olsen: yes
Jensen: yes

Gang Officer of the Year Award – Chief Gary Jensen.

Logan City Police Chief Gary Jensen recognized Detective Denny Bird who recently received the Utah State Gang Officer of the Year Award. Detective Bird is a NOVA Officer in the Logan City Elementary Schools.

Canal Update – Mark Nielsen.

Public Works Director Mark Nielsen gave an update on the canal. He stated the canal project is underway and Cache County has selected a project management consultant to start the planning process. They are currently working on a request for proposal for a design engineer for the canal facilities. The consultant will be ready May 1, 2012. The project team will design the facilities from May 1 to October 1 and start the construction process of box culverts and piping from the Logan River in the Logan Canyon to 1500 North. The current intended schedule is that most of the construction will be completed during the winter of 2012 and 2013. The entire project is projected to be completed in the

Spring of 2014. The 1500 North pipeline will come down the street from the bridge at Deer Crest and will go along the Logan/North Logan boundary to the lower canal. The Council will need to decide if there should be any diversions from the canal to help with power generation. The Council also will also need to make a decision regarding storm water on the upper canal. Mr. Nielsen will meet with the Mayor and Council on these two issues. Regarding the homes on Canyon Road, Logan City is working to acquire these homes and have currently purchased six homes, two that are scheduled for closing next week and another under contract. There are five more that are interested in selling and there are some that will choose not to sell.

Councilmember Olsen said the canal project involves the effort from various agencies, he asked Mr. Nielsen if this is still in the best interest for Logan City to go in this direction.

Mr. Nielsen responded this is the best course and he would not change the decision that has been made regarding the canal project.

Sewer Phosphate/Algae Project Update – Issa Hamud.

Environmental Director Issa Hamud gave an update on the Sewer Phosphate/Algae Project. He said the State mandated that Logan City comply with certain requirements. The plan is very specific to what needs to be accomplished during the seven year compliance time period and also includes a timeline of what needs to be accomplished. This project has been underway for the past three years and we are working with USU to make the algae project successful. There are challenges and the goal is to present a plan to the City Council in April or May 2012 on how the algae program will work. Studies have been done on the growth of algae and have also looked into harvesting algae from the lagoons. Also studied are ways we can actually process the algae in terms of production for bio fuels. The challenges are that we cannot make changes in the lagoons and we have to make side pilot projects to perfect the technology. Logan City is working with what has been removed from the lagoon rather than the fresh product. This project will require a lot of money, he and Mayor Watts have traveled to Washington DC twice to request funding for this project.

Councilmember Olsen said he received a letter from Senator Mike Lee congratulating him on his reelection. He sent a letter back to Senator Lee asking for assistance in funding this project.

COUNCIL BUSINESS.

No council business at this time.

ACTION ITEMS.

PUBLIC HEARING - Budget Adjustment FY 2011-12: $61,882 for State funds received for alcohol enforcement for FY 2012; $109,398 for funds received from FEMA for Riverbank Restoration at the Logan River Golf Course – Resolution 12-20.

Chairman Quayle opened the meeting to a public hearing.

There was no public comment and the hearing was closed.

ACTION. Motion by Councilmember Ward seconded by Councilmember Daines to **approve Res. 12-20** as presented. Motion carried by roll call vote.
Ward: yes
Daines: yes
Quayle: yes
Olsen: yes
Jensen: yes

PUBLIC HEARING - Consideration of a proposed amendment to Section 5.04 of the Logan Municipal Code regarding Special Events, Itinerant or Transient Merchants, Mobile Food Vendor Licenses and Public Dance Halls/Cabarets – Ordinance 12-17.

Chairman Quayle opened the meeting to a public hearing.

There was no public comment and the hearing was closed.

Councilmember Ward stated in Section 5.04.050 Paragraph A he appreciates the language because it gives flexibility. In Section 5.20.040 Paragraph C it states that the applicant provide a valid driver's license which he feels should happen because they are driving a mobile vehicle. In Section 5.20.050 Paragraph D it refers to a flashing yellow beacon and the time period going go until 10:00 p.m. and he asked if this will be a problem.

Community Development Director Mike DeSimone stated the reason for the flashing yellow beacon is for safety so people can see the vehicle. Regarding the hours of operation, latitude can be approved if there is a special event.

Councilmember Daines asked about Section 5.20.050 Paragraph C regarding inspections and who would do the inspections.

Mr. DeSimone responded this is to make sure the vehicle is appropriately signed and in good working order. The inspection is done by the Community Development Department.

City Attorney Kymber Housley said Logan City is not doing a safety inspection defined by the State of Utah and he is not concerned about liability. The vehicle will need to comply with the requirements that are in the ordinance such as flashing lights, working signals, headlights, etc.

Councilmember Jensen asked about a background check and is there a consequence or limit if someone is not granted a permit because of their background check. He also referred to Section 5.20.060 Paragraph E; he suggested that in addition to the statement to "Be fully self-contained with respect to gas and water" that "waste" to added to this Paragraph.

Mr. Housley responded if there is a criminal background on an applicant and we don't feel comfortable licensing the applicant, they can challenge the decision. We will look at each applicant individually. He also said there was a suggestion to add the ability to extend hours for mobile food vendors and asked if the Council wants to add this to the ordinance.

Chairman Quayle responded yes, they would like to make the addition to extend the hours.

ACTION. Motion by Councilmember Ward seconded by Councilmember Jensen to **adopt Ord. 12-17** as amended. Motion carried by roll call vote.
Ward: yes
Daines: yes
Quayle: yes
Olsen: yes
Jensen: yes

PUBLIC HEARING - Consideration of a proposed rezone of approximately 30 acres of the intersection located at 1200 East and 1400 North (Gravel Pit) – Ordinance 12-18.

Chairman Quayle opened the meeting to a public hearing.

Citizen Tony Nelson addressed the Council he lives at the corner of 1400 North 1400 East. He represents the Pat Hancey family and their request that the proposed area is rezoned back to single family. They also requested the small triangle behind the Foothill Mart/Shell Gas station on 1400 North be changed from Mixed Use back to Commercial. They feel that Logan needs more single family housing and they would like to develop this property with single family homes.

Jack Peterson addressed the Council regarding the proposed rezone. He and others in this area give their full support to the recommendation from the Planning Commission, staff and owners of the property to be rezoned back to the way it was. They support changing the property back to Residential Eastside and also support the change back to Commercial Zoning of the smaller piece of property. They appreciate the owners desire to make this happen and highly recommend the Council approve this rezone.

Chairman Quayle closed the public hearing.

ACTION. Motion by Councilmember Olsen seconded by Councilmember Ward to **adopt Ord. 12-18** as presented. Motion carried by roll call vote.
Ward: yes
Daines: yes
Quayle: yes
Olsen: yes
Jensen: yes

WORKSHOP ITEM.

Downtown Specific Plan – The Specific Plan will guide development, transportation enhancements, and provides market and economic recommendations for the City of Logan and the Logan Downtown Downtown Alliance. More information can be found at http://www.loganutah.org/CommunityDevelopment/DTLSP/index.cfm - Mike DeSimone.

Community Development Director Mike DeSimone stated the Downtown Logan Specific Plan guides the future development, transportation enhancements, and recommended market and economic restructuring for the City of Logan and the Logan Downtown Alliance over the next 40 years. This Specific Plan describes a vision for the Downtown and the necessary actions to achieve that vision, and provides the blueprint for the future development of the downtown area.

The Downtown Logan Specific Plan adopts the National Trust's "Main Street Approach" in its methodology and incorporates the approach's four principles, Design, Economic Restructuring, Promotion and Organization into the overall plan framework.

The Downtown Specific Plan is consistent with the Logan General Plan, the Land Development Code, the visioning plan "The Future of Downtown Logan". and the Historic District Design Standards.

Councilmember Daines said regarding the Wayfinding system she asked if money will be set aside for the signage. She feels this might need to be phased in for key locations and recommended that we start putting funding toward this project.

Finance Director Richard Anderson responded at this time we are looking at flat budgets so the best way to fund is reprioritizing funding.

Councilmember Olsen asked about the description of "traffic calming" on key retail streets.

Mr. DeSimone responded "traffic calming" is a method to try and slow traffic down and move traffic along efficiently.

Chairman Quayle asked Logan Downtown Manager Gary Saxton if the Downtown Alliance and the downtown merchants have bought into this plan.

Mr. Saxton responded there is a lot of information in the Specific Plan and they are working to prioritize what they can do first and what is the most beneficial. They are meeting with property owners regarding facade improvements and way finding. They are also looking for ways to improve shopping in the downtown. They are also encouraging private investment to help with the progress. He would like to dispel some of the perceptions that the City isn't supportive of the downtown and wants to have a good solid partnership between Logan City and the downtown.

Chairman Quayle asked are more people supporting the Downtown Alliance.

Mr. Saxton responded when he started as the Downtown Manager, there were 42 property owners that were involved in the Downtown Alliance and now there are 160 that are supporting the Downtown Alliance. He said the Council's approval of the Downtown Specific Plan will give validation to what they are trying to accomplish in the downtown.

Mayor Watts stated there have been great improvements in the downtown such as coach lighting and parking improvements. He feels with improvements being made we are getting positive responses from the downtown and we are going in the right direction.

Councilmember Jensen stated that he was part of the downtown design committee. He feels the Specific Plan is critical and the downtown will strengthen the surrounding neighborhoods if we have an exciting downtown. He feels the Downtown Specific Plan is a working document and the plan is flexible. We need to integrate a transition zone between single family housing to higher density housing.

Mr. Anderson said regarding wayfinding, funding could come from multiple sources such as the Redevelopment Agency, CDBG and other funding sources including the general fund. We can phase this in and over time and allocate funding.

OTHER CONSIDERATIONS.

No other considerations were discussed.

RECESS TO MEETING OF LOGAN REDEVELOPMENT AGENCY.

WORKSHOP ITEM:

PUBLIC HEARING - Consideration of a resolution approving Agency Assistance in Neighborhood Nonprofit Housing Corporation's "Welcome Home – Own in Logan" Program – Resolution 12-19 RDA.

Chairman Quayle opened the meeting to a public hearing.

There was no public comment and the hearing was closed.

Councilmember Ward feels the *Welcome Home Program* is very important and the Council needs to seriously consider this interim funding. He feels this is something we should have as a priority and is a long term benefit to our community.

Councilmember Daines stated the funding comes from Redevelopment Agency funds that have to be applied specifically to housing projects.

Mayor Watts feels the *Welcome Home Program* is a "jewel" in bringing back vitality to our community.

ACTION. Motion by Councilmember Olsen seconded by Councilmember Daines to **approve Res. 12-19 RDA** as presented. Motion carried unanimously
Ward: yes
Daines: yes
Quayle: yes
Olsen: yes
Jensen: yes

ADJOURN.

There being no further business to come before the Council, meeting adjourned at 6:55 p.m.

Teresa Harris, City Recorder

Excerpt from Minutes of the May 22, 2012 Logan Municipal Council Budget Workshop.

Environmental – Issa Hamud, Director.

Environmental Director Issa Hamud addressed the Council regarding his proposed budget. He said this year's budget is similar to last year's budget.

Mr. Hamud gave a presentation on the Logan City Wastewater Treatment Master Plan. He outlined the need for the project, approach to meet current and future needs, treatment options, implementation of recommended alternatives and the next steps for the project.

He stated the need for the project is the total maximum daily load (TMDL) study for the Cutler Reservoir resulted in total phosphorus limits. Phosphorus is a nutrient that promotes algae growth in lakes and streams. Excessive algae growth can cause water quality problems, including low dissolved oxygen. Logan City's wastewater discharge permit includes phosphorus limit and the compliance schedule. The compliance schedule is a complete construction of wastewater treatment upgrades by September 1, 2016 and achieve compliance by October 1, 2017. The approach is to use the existing lagoons in parallel with a new treatment process to reduce the overall capital and operation and maintenance costs. Also, to provide a phased expansion/upgrade to meet future needs. Treatment options will evaluate a variety of treatment options including: extended aeration bioreactor, membrane bioreactor, biological aerated filter, sequencing batch reactor and algae treatment.

Mr. Hamud explained the Logan Lagoons Treatment Plant Algae Process. The next steps are to submit the Wastewater Master Plan to the Utah Division of Water Quality (DWQ), apply for funding from the DWQ and begin a pre-design for site development.

Minutes of the meeting of the Logan Municipal Council convened in regular session on Tuesday, September 18, 2012 at 5:30 p.m. in the Logan City Municipal Council Chamber, 290 North 100 West, Logan, Utah. Chairman Dean Quayle conducting.

Council members present at the beginning of the meeting: Chairman Dean Quayle, Vice Chairman Holly Daines, Councilmember Herm Olsen, Councilmember Karl B. Ward and Councilmember Tom Jensen. Administration present: Mayor Randy Watts, City Attorney Kymber Housley, Finance Director Richard Anderson and Deputy City Recorder Sylvia Tibbitts. Excused: City Recorder Teresa Harris

OPENING CEREMONY.

Chairman Quayle called the meeting to order and welcomed those present. Sgt May from the Utah National Guard 142nd Military Intelligence Battalion performed the opening ceremony. He introduced himself with a short history of his service, gave a thought and led the audience in the pledge of allegiance.

Chairman Quayle welcomed those present. There were approximately 33 citizens in the audience at the beginning of the meeting.

Meeting Minutes. Minutes of the council meeting from September 4, 2012 were reviewed and approved with minor changes.

Meeting Agenda. Chairman Quayle announced at tonight's meeting there would be two public hearings. Councilmembers Daines and Olsen asked that 2 items be added to the council agenda regarding a report of the Utah League of Cities and Towns meetings, and apartment owners' compliance with ordinances. Holly moved to adopt the council agenda. Tom seconded the motion. The motion carried.

Meeting Schedule. Chairman Quayle announced that regular council meetings would be held the first and third Tuesdays of the month at 5:30 p.m. The next regular council meeting is Tuesday, October 2, 2012.

QUESTIONS AND COMMENTS FOR MAYOR AND COUNCIL.

David Welch, a resident who lives on the east bench of Logan City near Dry Canyon, spoke of the Canyon Winds and recreational fires from people who live above them. The smoke from these fires interferes with the evening activities of those who live below them on a regular basis. He reported that recreational fires are exempted from fire laws as per the fire chief. He indicated there are no ordinances, laws or statutes presented in the International Fire Code which Logan has adopted that regulate exempted fires, smoke or noxious odors as in this situation. He encouraged the council to consider an ordinance regulating recreational fires for homeowners in situations like what he and his neighbors are presently facing. Fire Chief Jeff Peterson and City Attorney Kymber Housley replied that this is basically a policy decision the council would need to decide and how involved they want to be. Kymber said the City could pass an ordinance, prohibiting recreational fires, but the question is whether we want to. His concern is it could impact so many other people who are not in this particular type of situation and it would have unintended consequences. It seems that this is a unique scenario involving canyon winds. There is a challenge with this matter. Councilmember Ward asked if the issue could be addressed on a case by case basis through the nuisance ordinance. Attorney Housley replied he is hesitant to craft regulation of these types of activities. Open pit recreational fires are presently allowed and we would need to have subjective criteria for when it is allowed. Councilmember Olsen added a premise for limitations and restrictions could be imposed on yellow or red burn days. Councilmember Jensen asked Mr. Welch if the involved neighbor has been approached. Mr. Welch responded they have attempted to reason with the neighbor on several occasions, however they have not had any cooperation from him. Mr. Welch noted that their intent is not to prohibit recreational fires, but to prevent the nuisances that come from them.

Leo Erickson, a resident of Logan City who lives next to Mr. Welch reported he has done fairly extensive research as to what other cities in Utah are doing in this case. Sandy City has taken the two first bullets of the International Code and added a nuisance part and the authority to ask the person who created the fire to extinguish it. It also has a paragraph saying neighbors should try to work together. It also states that if there is going to be a big fire, to let the neighborhood know. If the fire becomes too bad, the neighbors could call the city. Basically, the only relief he and his neighbors have is when the individual involved goes on vacation. He is concerned that these fires are a real detriment and a nuisance to the neighborhood. Mr. Housley added that to be exempt, dry wood must be used so as not to create excessive smoke and the City can regulate that. Additionally, there are civil remedies available to those private property owners affected in the neighborhood. Councilmember Ward advocated the City should look at what remedies do exist. Councilmember Daines advised looking at language other cities have used. There might be some refinement there. Fire Chief Peterson reported he has asked the Fire Marshall what was being burned at this residence, to which he was told it looked like green waste materials at the time the Fire Marshall observed it.

Bill Bower, a Logan City resident, said that in his neighborhood on any given day people in his neighborhood could have a fireplace going or other legal fires at the same time. He is not in favor of more regulation by the City and doesn't feel a regulating ordinance is needed for this. He feels the root problem is not the smoke, but the attitude of the property owner doing with his property whatever he wants.

Chairman Quayle closed this portion of the meeting.

MAYOR/ STAFF REPORTS.

Presentation: Branding Cache Valley – Kirk Jensen.

Economic Development Kirk Jensen provided a background and context to the need for this venture which began about 2 years ago when the vice president for ventures and strategic economic development for Utah State's Innovation Campus wrote to the Cache Chamber of Commerce asserting that Cache Valley did not have a cohesive branding strategy for Cache Valley to market outwards to high tech companies such as Salt Lake has and other parts of the country. Those who serve the Cache Chamber of Commerce realized what was being said and agreed that there is not presently a single branding strategy to bring business into the valley that seeks to cultivate business coming into the valley. Through Mr. Jensen, the Chamber has hired Mark Hurst as the consultant for the branding initiative. Mr. Jensen spoke of Mr. Hurst's accolades including the "Life Elevated" campaign that Utah has. The whole effort for Mr. Hurst and his team is determine what the essence of Cache Valley is. Mr. Jensen pointed out to the Council that this is not an effort to ask for any money, it is merely for informational purposes. He turned the time over to Mr. Hurst to give a presentation to expose the Council to their branding effort. Mr. Hurst spoke of his personal relativity to Cache Valley. In branding Cache Valley, he strove to determine what the essence of Cache Valley stands for and how it resonates with an audience over time in attracting tourists and jobs. He visited with some council members, nearly 50 businessmen in Cache Valley, and nearly 50 people in the Salt Lake valley in his research. The most regular answer he received was "cheese" and "cows". He figures there will be 30,000 more people in this valley before the next census. It is important to have new jobs to keep our educated workforce here. There needs to be an outreach to our local market as well as on a national basis. His firm has produced a 50 page evaluation report that is available through Mr. Jensen. He pointed out that the slide presentation he prepared summarized the evaluation report. He said the object is to create jobs and connect to the vitality of the wired world. Never leverage our heritage, but never let it hold us back. The object is to take our perceived negatives and turn them into our greatest strengths.

He gave a slide based presentation entitled "Cache Valley – On The Edge", that could be produced in video form. Additionally, he shared hypothetical ad possibilities for national journals. He also shared some print ad possibilities he has developed.

Chairman Quayle asked what the next step might be. Mr. Hurst deferred the question to Mr. Jensen, adding that he envisions a local campaign to procure funding to produce the video and other advertisement. The next step would be a timetable, budgeting, and strategic planning.

Algae Harvesting Project – Issa Hamud.

Chairman Quayle reported the council has visited the sewer lagoons and observed that the first unit is in place to begin harvesting algae.

Mr. Hamud gave a general overview of the improvement project for wastewater treatment. The City is currently working with the State for additional funding. After, he will report back to the Council. Also, they are still negotiation for property for expansion. Mr. Hamud added that he is working with the State of Utah for additional funding to expand the project. They are also purchasing additional property for staging purposes.

This project involves experimenting with the use of algae that is ongoing with USU for treating wastewater. It is the size of 1500 gallons. Councilmember Olsen reported that there will be a presentation Thursday at 4:00 pm and a tour of the facility at the sewer lagoons. USU continues to perfect some technologies they are researching that hopefully the City can utilize and participate in. Mayor Watts spoke of how the City is going to continue to treat wastewater and how we need to meet the demand to reduce the phosphorous levels.

Mayor Watts added that there are many projects going on in the valley and this project could become the biggest single issue in the future as far as dollars. They are trying really hard to make this stay within a parameter of 20 years with much less than $200 million for a total treatment plant. The algae grows on the lagoons and it is huge in its magnitude. There is too much phosphorus in it. This is a matter of handling wastewater. This project is going into production to help meet the mandate that is coming in a few years to reduce the phosphorus level.

Chairman Quayle asked what the byproducts of the algae drying are. Mr. Hamud said that the algae can be dried and oil extracted from it for biodiesel production, or it can be processed to produce ethanol, beutenol and methanol to be used for other purposes. They can also digest it and produce methane gas from the digester and it can be used for fuelling our trucks or generation of power.

Chairman Quayle thanked Mr. Hamud for his report.

COUNCIL BUSINESS.

Gossner Foods Recognition – Chairman Dean Quayle.

Chairman Quayle read a statement he had prepared in honor of Gossner's Foods. Gossner's has been on its present location since 1966. Chairman Quayle spoke of the accolades and contributions of Gossner's Cheese. He commended Gossner's for their efforts and business practices. Councilmember Ward spoke to the great impact in employment and benefits to the community. Mayor Watts added his admiration for Delores Wheeler and the Gossner family for hanging onto the business and helping to keep farmers afloat during the hard times to keep their product coming in. He recognized and thanked Delores for what her father and the Gossner's family has contributed in this valley.

Councilmember Daines gave a brief report of the Utah League of Cities and Towns league meetings held in Salt Lake City last week. She distributed to the council members a list of several of the 2012 ULCT resolutions and issues they will be focusing on when the legislature meets in January. She advised the council members that now is the time to contact the League if they have any input. She spoke of the workshop that made specific suggestions in making government more transparent for the citizens.

Councilmember Jensen added that he was impressed with reports at the League meetings of small communities doing wonderful things.

Councilmember Olsen spoke of the damaging component to neighborhoods when apartment owners will fill up their apartments with 4, 5 and 6 students in violation of zoning ordinances and if perhaps a neighbor discloses the violation, the owner cleans up the place for a few months and when nobody is looking, violates again. His anxiety is that we don't have the money to hire several new enforcers to go out into the neighborhoods. We only have the monies to respond only to complaints. He asked what it would take to change ordinances in terms of penalties to send messages to apartment owners that there are limits and restrictions. If there are apartment owner who regularly violate ordinances, we may want to craft some rather severe penalties to force those owners to pay attention so there is a financial incentive to comply. Councilmember Daines said perhaps the problem is with single family residential owners who overload their houses with students. Councilmember Olsen agreed. This is what he suggests the council revisit. Attorney Housley advocated inviting Jim Geier from Neighborhood Improvement attend a council meeting to report as to what they are presently doing. He felt the program only works when neighbors participate in such ways as taking down license numbers on vehicles where possible violations occur. He added that the City does prosecute and go after the violating property owners and succeeds in these efforts. He is not aware of a single occupancy case that the City has lost. Civil penalties are charged, however, criminal action can be taken on repeat offenders. Attorney Housley said the City might want to focus on getting the word out to the neighbors to encourage them to get involved and do the reporting and the City will follow up.

Councilmember Olsen advocated having Jim Geier invited to attend a future council meeting as well as the neighborhood chairs to share a collective sense of what they are dealing with. Kymber added that it will give the City an opportunity to identify the issues. He spoke of the various types of occupancy violations and some fit into the nuisance category or disorderly house, rather than an occupancy violation.

Councilmember Olsen advocated sending notice to neighborhood chairs to invite them to bring input on this subject. Councilmember Daines noted that the neighborhood chairs are currently on the agenda for the second council meeting in October to present some suggestions they have, not related to occupancy, however, they will be here and can give some input as to the occupancy issues. Councilmember Olsen need to let them know the council would like to address this issue with them as well. Councilmember Daines is the liaison for the neighborhood chairs, and she offered to give them the information and the invitation. Councilmember Jensen would like this viewed as an opportunity to strengthen the fabric of the neighborhoods in a coordinated effort. Attorney Housley admonished the council to come up with suggestions as to how to get the word out.

ACTION ITEMS.

PUBLIC HEARING - Budget Adjustment FY 2012-13 appropriating: $21,071 for contributions from the Logan School District for the replacement of the tennis court $3,900,000 for the NRCS Logan River Dredging Project; $549 for the awarded EMS Grant to be used for certification, training, and continuing medical education for the Communication Center – Resolution 12-62.

Chairman Quayle opened the meeting to a public hearing.

There were no comments and Chairman Quayle closed the public hearing.

ACTION. Motion by Councilmember Ward seconded by Councilmember Olsen to **approve Res. 12-62** as presented. Motion carried unanimously.

PUBLIC HEARING – Consideration of a proposed resolution specifying the preferred intersection improvements for the 200 East Project from 450 North to 1250 North – Resolution 12-64.

Chairman Quayle opened the meeting to a public hearing.

Alex (?), a Logan Resident lives near the Transit Center. He reported that he and his daughter have nearly been hit at 500 North and 200 East. He said nobody stops for the stop signs now. He feels that if a roundabout is put in, the situation will only get worse. He encouraged the council to think about the children and the future. He wonders what is so important about the roundabout. Chairman Quayle asked him if he had a better solution for this intersection. Alex said he would like to see a street light placed at this intersection. He has called the police previously with concerns and complaints and feels he is getting little response.

Ann Geary from the Board of Education reported the Board applauds the council's decision to put in an intersection with lights on 1000 North and 200 East. She encouraged the council to look at obtaining crossing guards there even with a street light and on 900 North 200 East. She added that the Board also applauded the planned island in front of the Middle School eliminating left hand turns coming out of the school area and reducing hazardous situations there. Councilmember Olsen reported the width of the crosswalk at 900 North would be 3 feet rather than 8 feet. Chairman Quayle asked Ann about parent-specific drop-offs on 200 East. Ann replied they are encouraging parents as to where to safely drop their children off, however the Board is still working with a consulting firm on a solution.

Councilmember Olsen asked Ann if the Board has arrived at any conclusion with regard to the roundabout on 500 North 200 East. Ann reported they have looked at the studies and are uncomfortable in giving an opinion based on the information they received as it pertains to a double roundabout as opposed to a single roundabout that is planned.

Logan Resident (?) is against the roundabout. She feels a roundabout will tie up the traffic. She said all of the traffic line up will have to stop on 400 North anyway and on the roundabout as well. A whole block of cars can be put through that intersection with one stop light cycle.

Carl Strucki, a Logan resident who lives on 200 East suggested banning all on street parking on 200 East from Thanksgiving to April. He suggested a one-way road on 200 East and 200 West. He also advocated for no additional entrances on the west side 200 East. He agreed the roundabout on 1000 North won't work. He can barely get onto the street with the street light now.

Mary Godfrey, a Logan resident spoke. She is legally blind and uses a white cane when she is out and about. She uses the bus system to get around. In having a roundabout on 500 North and 200 East, she is concerned that the traffic might not see her. She presently crosses the street where there is a light or stop signs to get to the Transit Center. She doesn't feel safe crossing in a roundabout even with flashing lights. She encouraged the council to reconsider the roundabout at this intersection.

Chairperson Quayle asked Mark Nielsen to comment on options at this intersection. Mr. Nielsen reported that all options are available, however, he has a concern with a signal at 500 North and 200 East. Two signals a block apart are not going to work 20 years from now. As far as safety, stop signs are where drivers yield the best, however, they do choke up traffic and may require putting in a signs in the future. Councilmember Olsen asked about the timing of the one-way couplet study. Mr. Nielsen replied the study would be finished before any construction is done on this project. If the study chooses 200 East as a one-way road, it would affect any plans for the roundabout. As to Ms. Geary's comments, Mr. Nielsen said the median on 900 North is 2 feet wide as proposed. It eliminates left turns out of the drop off for busses, however, it preserves the parking on the East side of 200 East. It will not create a safe haven for students in the median. The school zone flashing lights will remain in place if crossing guards are placed there.

Police Chief Gary Jensen reported to a request from the council pertaining to the costs of crossing guards. Each crossing guard is about $4,000 per year and that is just dollars. The other problem is getting people to apply for the job as the hours and seasonal challenges deter many from applying. It is already an ongoing problem for the Police Department to fill the crossing guard positions they already have.

Annette Pearson, a Logan resident, is concerned about the 500 North roundabout. Her primary concern is for safety, rather than traffic control at the 3 major intersections involved on 200 East particularly 500 North. Her biggest concern particularly is for the safety of the elementary school children moving about. She advocated using the roundabout money for other items such as enforcement of pedestrian safety or potholes and leaving the 4-way stop there as it is.

Sabrina Cropper a Logan resident, advocated for use of crossing guards for safety of students. She also feels a light would be the best resolution at 500 North 200 East. As a bicyclist, she is concerned that at 500 North 200 East, drivers would fail to see a bicyclist and pull into the roundabout without yielding because they are looking for a car, not a bicyclist or a pedestrian.

Bill Bower at 990 North 200 East said a lot of traffic comes up 1000 North and with the USU residential development further up the street, there will be more traffic. He has seen people going the wrong way in the roundabout on 1800 North and 200 East. Safety of the public and pedestrians should be foremost. He expressed his concerns for police enforcement as it pertains to pedestrians and vehicles.

Marilyn Griffin, a Logan resident, spoke about roundabouts. She lives at 600 North 200 East and sees traffic back-ups often. She has to make adjustments to get onto 200 East from her home depending on the time of day. She feels that drivers can make adjustments in traveling this area during certain times of the day by utilizing other roads. She is aware of some near misses on 200 East between 500 North and 1000 North, but no accidents. If there is a roundabout, the pedestrian crossings need to be well marked, not only with paint. She suggested stamped, colored concrete in the crosswalks. The crosswalks need to be visible before vehicles reach the intersection. She spoke about the possibility of raised crosswalks. She appreciated the council and administration considerations and involvements.

Conley Thompson, a Logan resident, had a question pertaining to the culdesac he lives in on 870 North and the raised median. He doesn't favor a left hand turn only onto 200 East from this culdesac. Mark Nielsen confirmed there would be only a left hand turn in the current plans. He feels that if the City is fixing a problem between 500 North and 600 North, they will create the same problem from 800 North to 1000 North as it pertains to neighborhood qualities. He feels the answer is not to create a traffic corridor on 200 East.

Rachael Rasmussen, a Logan resident has a daughter and son-in-law who are disabled. They have no choice but to use the transit system to get around. She feels that a roundabout with flashing lights on 500 North 200 East would confuse them. She is concerned that this scenario would also be confusing to many disabled riders of the Transit System.

Crystal Burningham, a Logan resident showed a photograph she took of 2 handicapped individuals who live on 200 East who were utilizing a motorized cart and a wagon for their transportation. She thanked the Council for listening to the residents' concerns who live along the 200 East Corridor and resolving to keep a traffic signal at 1000 North 200 East. She wanted to clarify that single lane roundabouts are safer for car to car contact, however, they are not safer for bicyclists, handicapped individuals and car to person contact. She thanked the Council for their help. She advocated for tabling of the roundabout decision on 500 North 200 East until more information on this matter can be obtained.

Janice Morris, a Logan resident stated that traffic near the middle school and 500 North on 200 East is a terrible problem. She already has difficulty getting out of her driveway due to traffic before and after school. She is concerned with students bailing out of busses right into the streets on this corridor and at the Transit Center. She advocated for a crossing guard on 900 North. She would like to see the school zone extended to the Transit Center. She appreciated the Council for putting a street light in at 1000 North and responding to the citizens.

Councilmember Ward voiced concern with the resolution as presented with the roundabout on 500 North and 200 East. He questioned the information as it pertains to pedestrian safety in a roundabout. Councilmember Daines suggested tabling the 500 North roundabout decision until the one-way couplet study comes in and complete the rest of the design. Mark Nielsen said that is possible, however, it will delay the project. However, the whole plan will change if the one-way is put in. Some property purchases are already made at the involved intersections. Any additional properties needed have been identified. Councilmember Olsen asked the JUB engineer present about the study of the roundabouts and informational guides. JUB reported a roundabout for a pedestrian would be safer than a signal. Also, a roundabout would create fewer contact points for pedestrians than a 4-way stop.

Mark Nielsen reported that according to the NCHP 572, bicyclists have larger dangers in roundabouts. Other vehicles don't seem to see the bicycles as a vehicle taking the entire lane. The JUB engineer added that single roundabouts seem to be safer for bicyclists than double roundabouts.

Councilmember Ward asked Crystal Burningham about the study she read regarding safety for the disabled at roundabouts. She replied that nationwide, improvements are not being put in for the visually impaired and disabled according to the study. Also, in her research, she found reports indicating there were more bicycle accidents at roundabouts than other types of intersections.

Chairman Quayle closed the public hearing.

Councilmember Ward inquired as to construction delays if 500 North was tabled. Mark Nielsen indicated the delay would be approximately one year as the couplet study would not be finished until the first of next year. He would not like to begin any construction in the autumn. Also, the project needs to be bid at one time. Councilmember Jensen indicated he would be in favor of moving ahead with the 500 North roundabout. Chairman Olsen agreed, however, he is not concerned to wait until the couplet study is complete. Councilmember Ward would like to see additional research as it pertains to handicapped people and possible dangers involving them with a roundabout. He would like to have a month. Councilmember Jensen agreed.

Councilmember Olsen reiterated the motion presently before the council is to accept including items 1, 2 and 3 of the proposed resolution due to the paramount safety issues still up in the air. He is in favor of this motion. Councilmember Jensen would like to table the discussion about 500 North 200 East for further discussion.

ACTION. Motion by Councilmember Daines to accept items 1, 2 and 3 while deferring item 4 for discussion at the 2nd Council Meeting in October to obtain further research information seconded by Councilmember Olsen to **approve Res. 12-64** as amended. Motion carried unanimously.

WORKSHOP ITEM.

Budget Adjustment FY 2012-13 appropriating: $130,073 for the 21st Century Grant; $400,000 for the County Road Tax Grant (Public Works Grants); $3,100,000 for the County Road Tax Grant (Public Works Class C) – Resolution 12-63 – Richard Anderson.

Finance Director, Richard Anderson clarified to the members of the council that the $400,000 was coming from Class C Road Funds and the $3,100,00 is coming from the County Road Tax Grant.

This will be a public hearing and action item at the October 2, 2012 council meeting.

OTHER CONSIDERATIONS.

There were no other considerations stated.

ADJOURN.

There being no further business to come before the Council, meeting adjourned at 8:05 p.m.

Sylvia Tibbitts, Deputy City Recorder

Minutes of the meeting of the Logan Municipal Council convened in regular session on Tuesday, February 19, 2013 at 5:30 p.m. in the Logan City Municipal Council Chamber, 290 North 100 West, Logan, Utah. Chairman Holly H. Daines conducting.

Council members present at the beginning of the meeting: Chairman Holly H. Daines, Vice Chairman Tom Jensen, Councilmember Karl B. Ward and Councilmember Dean W. Quayle. Administration present: Mayor Randy Watts, Public Works Director Mark Nielsen, City Attorney Kymber Housley, Finance Director Richard Anderson and City Recorder Teresa Harris. Excused: Councilmember Herm Olsen.

OPENING CEREMONY.

Council Member Dean Quayle gave the opening thought/prayer and led the audience in the pledge of allegiance.

Chairman Daines welcomed those present. There were approximately 8 citizens in the audience at the beginning of the meeting.

Meeting Minutes. Minutes of the council meeting from February 5, 2013 were reviewed and approved with no changes.

Meeting Agenda. Chairman Daines announced there are no public hearings scheduled for tonight's council meeting.

Meeting Schedule. Chairman Daines announced that regular council meetings would be held the first and third Tuesdays of the month at 5:30 p.m. The next regular council meeting is Tuesday, March 5, 2013.

QUESTIONS AND COMMENTS FOR MAYOR AND COUNCIL.

Logan resident Tony Nielson, 1393 Boxwood Circle. Mr. Nielson said commendation should be given to those in the City who organize and attend the neighborhood council meetings and he thanked them for their hard work. He also said snow removal is a property issue and property owners should take care of their own property both residential and business owners. He feels if property owners don't clean their sidewalks a fine should be imposed. He also talked about the bus stops on 1000 West and said all of the stops are closed because there is only one lane of traffic and the bus cannot stop anywhere. He suggested an alternative route for the bus to go around the construction zone. He said there are a lot of people that work in this area and asked the Council to consider an alternative route so they can still ride the bus.

Councilmember Quayle offered to contact Transit Director Todd Beutler regarding the 1000 West bus stops. He also said at the last council meeting it was suggested that crossing guards and the parking authority could help in reporting areas where snow removal is needed on sidewalks. He asked Police Chief Gary Jensen for an update on this suggestion.

Chief Jensen responded that the problem in asking the crossing guards to monitor snow removal is it would take them away from what they are doing and they need to be watching traffic and children as they cross the street. The parking authority could be involved as well as on duty police officers.

Chairman Daines suggested the parking authority could keep a small notebook and could write down problem areas where snow is observed on the sidewalk. They could give this information to someone at the police department who could keep a record of the problem areas. She also stated that on a yearly basis the fire department sends out a reminder on weed abatement and suggested this same process be used for snow removal on sidewalks. She suggested coming up with a letter, especially for businesses owners reminding them to clear their sidewalks.

Councilmember Jensen said he recently drove in the area of 600 East and after three weeks, there are still properties that have not cleared the snow on the sidewalk. He said with our digital age, he suggested a location on the Logan City website where people can put an address where snow needs to be cleared on the sidewalk and alert people that it's a problem.

MAYOR/ STAFF REPORTS.

North Valley Landfill Report – Issa Hamud, Logan City Environmental Director.

Issa Hamud, Logan City Environmental Department Director addressed the Council regarding the North Valley Landfill. He said a permit was issued from the State of Utah last week and we are now legally allowed to use the landfill. There are still a few issues that need to be addressed before garbage can be taken to this location. This is 530 acres and is on the boarder of Idaho. Out of the 530 acres there are 329 acres allocated for landfill use and a permit was issued. He intends to use at least 133 acres and a design has been submitted for this property. There will be two entrances to the landfill property. The next step is to apply for a conditional use permit and he currently has all the information to meet the requirements for the permit. The property has been zoned by Cache County as a landfill. The focus will be access to the property and the costs involved. The four options will be presented to Cache County and they will make the decision on the route the garbage trucks will take to the new landfill which will also determine the cost. There has been a concern about the Martin Harris Pageant that is held in this area every other year for a 10-day time period. Crews will work around the pageant so it will not cause any disruptions.

Mr. Hamud said the road will be a hard surface and these will be less than 15 trucks per day traveling along this road. No trucks will go through neighborhoods unless the road goes through Clarkston Town. The route next to the Clarkston Cemetery is an option.

Mr. Hamud also gave an update on the Waste Water Treatment and the phosphorus requirement that was mandated by the EPA three years ago. Comments came back from the State of Utah that indicated in addition to the phosphorus requirements, the State also want us to comply with ammonia limits which are more stringent than what we are currently discharging. Our current limit is 11 and the State wants us to cut back to 1 which would require Logan City to build a full mechanical treatment plant. Logan City is currently evaluating the options and how we respond to this request. The phosphorus requirement is statewide and is something the City was aware of and is working on. The ammonia issue is somewhat concerning and is based on a law that the Water Quality Board adopted in 2008 even though our permit was received in 2011 and nothing was previously mentioned regarding ammonia. We will comply with the ammonia requirement by the year 2040.

Mayor Watts added that because of the size of the lagoons we need to in the process continue using the lagoons. Half of the lagoons will continue as they have been working and by the year 2040 unless we get help, then we will at that time be a total treatment plant which is very costly.

Mr. Hamud said if we were to comply with the ammonia and phosphorus requirement and with the full flow of waste water we are receiving and with growth, it would be approximately 20 million gallons per day by the time we are in true compliance. The cost would be approximately $100 million and the question is do we borrow and build it all at once or build in steps. We are under a strict timetable and we need to present a plan to the State of Utah based on this timetable.

Chairman Daines recognized a local scout group that was in attendance at tonight's meeting.

COUNCIL BUSINESS.

Chairman Daines announced as a follow-up to our recent trails presentation that Russ Akina did two weeks ago, a public meeting has been scheduled on Thursday, March 28 to gather citizen input on the trails masterplan. This meeting will be held at City Hall in the main conference room. The public is invited to attend as well as neighborhood council chairs and all those who are interested.

ACTION ITEMS.

No action items scheduled at tonight's council meeting.

WORKSHOP ITEMS.

Budget Adjustment FY 2012-2013 appropriating: $6,823 for additional grant expenses for reimbursement on the Logan River Golf Course project; $15,001 to cover utility costs for the Willow Park Zoo for the remainder of Fiscal year 2013; $140,700 for betterments on the canal project including irrigation line, flow meters, slide gate and 1500 North restoration costs; $16,200 Class C Funding for a change order for additional modeling and analysis of one-way couplet alternatives (Restricted Class C Reserves) – <u>Resolution 13-11</u> – Richard Anderson, Logan City Finance Director.

Finance Director Richard Anderson explained the proposed budget adjustments:

$6,823 – This is an increase in the grant we received from the federal government for the Logan River Flood Project. This is a budgetary adjustment reimbursing us for the costs.

$15,001 – This amount is for the Willow Park Zoo and as part of the transfer arrangement the City was paying the utilities going forward. For the current year the remaining cost will be $15,001 and will be transferred from the Zoo to the Parks and Recreation budget.

$140,700 – This amount is for the canal project betterments and is coming from reserves in our storm water fund.

$16,200 – This amount is for a study of one-way couplets and is coming from Class C Funds.

Councilmember Jensen said that he requested an expansion in the study for one-way couplets and felt that more information should be given to the neighborhood and the downtown so the council can make a better decision on what to do.

The proposed resolution will be an action item and public hearing at the March 5, 2013 council meeting.

Consideration of a proposed Boundary Adjustment with Logan/North Logan – Mayor Randy Watts and Kirk Jensen, Logan City Economic Development Director.

The cities of Logan and North Logan began discussing potential boundary realignment along North Main Street about three years ago. The discussion was initiated by then, North Logan Mayor Cary Watkins and continued between Logan City and Mayor Lloyd Berentzen, along with members of both administrations and Councilmember Dean Quayle. Resulting from these discussions and negotiations, a parcel exchange proposal, has been informally consented to by the North Logan City Council and Administration. The intent is to workshop the proposal at tonight's meeting and should the Council consent to move forward, both council's would then simultaneously draft resolutions for their respective cities calling for realignment. Noticing and public hearings would then follow. Logan City would net a loss of 146 acres having a total assessed property value of $2.5 million, while gaining approximately $13k in tax revenue annually, based upon current revenue streams. There are obviously certain infrastructure challenges, as there would be even without realignment. The value of this proposition, from the Logan standpoint, is primarily the enhanced development potential of land fronting Main Street, given the resulting land depth within a single municipality off of this highway. Further, the boundary realignment along Main Street simplifies the number of transitions from one city to the other, from three down to one. Also, much needed sidewalk improvements along West 1800 North could be installed without an interlocal agreement. (Handouts consisting of the Current Alignment, Proposed New Boundaries, Comparison Summary and Proposed Map of the Parcel Exchange were distributed to the council members).

Logan City Economic Development Director Kirk Jensen referred to the Proposed Map of the Parcel Exchange and indicated this would involve 48 different parcels consisting of 20 businesses and a few residential properties for a total of 200 acres are involved in the transaction, North Logan would net an increase of 146 acres, representing $2.5 million dollars in real property value. Logan City would gain a net increase of tax revenue of $13,000 per year. The primary reasons for the parcel exchange would be the increased potential for development with greater land depth of the properties facing Main Street. Also, simplification of the transitions and the infrastructure issue on 1800 North in Logan where there is a lot of multifamily property, and adjusting the boundaries would alleviate the safety concerns of those walking to Main Street.

Logan City Attorney Kymber Housley said under the law, all that is required is three weeks of published notice for three consecutive weeks and the notice published on the State Website. Individual notice to the property owners is not required but the Council can choose to notice each property owner.

Chairman Daines said she would like each property owner to be notified with a letter letting them know when the public hearing will be held and give them any information regarding the boundary adjustment.

Mayor Watts said for future business growth, the question is what can Logan do to incentivize a business and the problem has been the boundary issues with North Logan. He feels the boundary adjustment is business friendly and helps both Logan and North Logan to reach their potential.

Councilmember Quayle asked about property taxes and money that goes to the Logan City School District.

Mr. Housley responded the school boundaries will not change with this boundary adjustment. There might be a slight change in property taxes but is not like taking property from the unincorporated County that has no municipal tax going to a City. We are changing from one municipality to another and if anything, it will be a fractional amount. North Logan and Logan know their tax rate and this information will be available at the upcoming public hearing.

Councilmember Quayle asked about infrastructure issues between Logan and North Logan.

Logan City Public Works Director Mark Nielsen said the plan for utilities is that overtime both cities will work to separate the utilities between the two cities. Snow removal will also be worked out with North Logan and Logan.

Councilmember Jensen said he is complimentary of cleaning up the boundary issues and feels this is a very positive step forward.

Councilmember Ward said he is concerned that Logan is giving up the potential for future commercial development. Most of what Logan is gaining is facing Main Street now and is already developed, there isn't much behind it. The remainder is all residential and Logan has a fairly narrow corridor, 1900 and 2000 North is all we have for commercial development and is something we should consider.

Mayor Watts said the concern has always been frontage and completing this boundary adjustment will straighten the boundary line. There is the potential for a future Economic Development Area along the corridor going to 2500 North.

Chairman Daines complimented Mayor Watts and Kirk Jensen on their negotiations with North Logan and feels we have a good, workable plan on the table.

Councilmember Ward said he would like to look at the boundary issue longer and in more depth. He referred to the area of 2500 North and North Logan development on both sides of the road, but then we run into the issue of depth size. He asked if it makes more sense to run the boundary line down 2200 North?

Chairman Daines suggested that Councilmember Ward meet with Kirk Jensen separately to review the map and look at other options prior to the March 5 council meeting and public hearing.

Mayor Watts complimented Councilmember Dean Quayle for taking the initiative to arrange a meeting and work towards an agreement with North Logan.

Councilmember Ward stated that he's in agreement to go forward with the boundary adjustment and public hearing.

Mr. Housley said the process for the boundary adjustment moving forward is that both council's need to pass a resolution in support, noticing process and then a protest. To stop the boundary adjustment through the protest period would require 15% of value and 25% of the land mass of the proposed area that is being changed. If there is not sufficient protest the Council's would pass an ordinance adopting the new boundaries and then it would be sent to the Lt. Governor's Office.

This will be an action item at the March 5, 2013 council meeting.

Consideration of a proposed ordinance amending Section 8.16.300 and enacting 8.16.740 of the Logan Municipal Code regarding Vehicle Air Brakes in Neighborhood Residential Zones – Ordinance 13-09 – Kymber Housley, Logan City Attorney.

Mr. Housley suggested that the wording on the ordinance be changed from **Vehicle Air Brakes to Vehicle Engine Brakes**. He said it would be best to have a "blanket ordinance" regarding Vehicle Engine Brakes that would cover any area in Logan City and signs would be posted where there is a need. The only area the council has a concern with at this time is the stretch along 600 South and 1000 West. If this ordinance is adopted and because 1000 West is a UDOT road, a copy of the adopted ordinance will be sent to UDOT with a request that signs be made for this area. If UDOT approves, they will install the signs and bill Logan City.

Chairman Daines said she received an email from business owner Tony Nielsen and he said there is also a concern regarding vehicle engine brakes along 600 West in the area of BATC and Fast Forward Charter School. She likes the way the ordinance is drafted so if there are other areas in Logan City, the council can consider future requests without going through the process of another ordinance being written.

The proposed ordinance will be an action item and public hearing at the March 5, 2013 council meeting.

Consideration of a proposed ordinance amending Sections 10.52.050(B) and repealing 10.52.290(E)-(F) of the Logan Municipal Code regarding Vehicle Impounding – Ordinance 13-10 – Sgt. Jeff Simmons, Logan City Police Department.

Mr. Housley stated the proposed amendment is to make changes in the fee structure to be consistent with the fees that have already been adopted and then removing **Section E. Impound of Vehicles** because it has already been covered in another section of the Municipal Code.

The proposed ordinance will be an action item and public hearing at the March 5, 2013 council meeting.

OTHER CONSIDERATIONS.

There were no additional items of consideration from the council.

ADJOURN.

There being no further business to come before the Council, meeting adjourned at 6:30 p.m.

Teresa Harris, City Recorder

LOGAN
CITY UNITED IN SERVICE
ESTABLISHED 1866

MUNICIPAL COUNCIL
290 North 100 West
Logan UT 84321

MEETING NOTICE – COUNCIL WORKSHOP
Tuesday, June 25, 2013 – 5:30 p.m.

PUBLIC NOTICE is hereby given that the Logan Municipal Council will meet in a Council Workshop in the **Logan City Hall Conference Room, 290 North 100 West,** Logan, Utah 84321 at **5:30 p.m.** on **Tuesday, June 25, 2013.**

5:30 p.m. 1. Call to Order

2. **ACTION ITEM:**
   A. **PUBLIC HEARING - Budget Adjustment FY 2012-2013 appropriating:** $450,000 to cover unanticipated medical costs in the Health Management Fund – **Resolution 13-48**

3. Presentation: Wastewater Treatment Improvement Project

4. Questions or Comments

7:30 p.m. 5. Adjourn

On Friday, June 21, 2013, at 5:00 p.m. a copy of the foregoing notice was posted in conspicuous view in the front foyer of Logan City Hall, Logan, Utah. A copy of this notice was faxed to the Herald Journal. The Agenda was also posted on the Logan City website at www.loganutah.org and the State Public Meeting Notice website at http://pmn.utah.gov.

DATED THIS 21st OF JUNE 2013 *Teresa Harris, City Recorder*

Council Member's may participate in the meeting via telephonic communication. If a Council Member does participate via telephonic communication, the Council Member will be on speakerphone. The speakerphone will be amplified so that the other Council Members and all other persons present in the Council Chambers will be able to hear all discussions.

In compliance with the American with Disabilities Act, individuals needing special accommodations or assistance during this meeting shall notify Teresa Harris, City Recorder, at 435-716-9002, at least 24 hours prior to the meeting.

Logan Municipal Council Meetings are televised live as a public service on Channel 17

APPENDIX A

A Selective Reconnaissance-Level Survey of Architectural Resources for the Logan Wastewater Treatment Facility Project Logan, Cache, Utah

Prepared for Horrocks Engineers
Pleasant Grove, Utah

By

Peter Steele, M.A. RPA
Project Engineering Consultants, Ltd.
West Jordan, Utah

August 15, 2013

PLPCO Permit #232
Utah Antiquities Project Number U-13-ZP-0596

Abstract
Horrocks Engineers requested that Project Engineering Consultants undertake a selective reconnaissance-level survey of historic architectural resources within a 62.9 acre area of potential effects (APE) related to the Logan Wastewater Treatment Facility in Logan, Cache County, Utah. The results of the survey are presented in this report.

This project's APE for architectural resources consists of a 62.9 acre (25.45 hectare) parcel located between the Logan Wastewater Treatment Facility in the north, 200 North in the south, 2200 West in the east, and 2600 West in the west. The APE also constitutes the survey area, within which a selective reconnaissance-level survey of historic buildings was undertaken.

A total of one property, including two buildings constructed within the historic era (during or before 1963), was identified in the APE. This property, located at approximately 250 North 2300 West, is recommended ineligible for the National Register of Historic Places (NRHP) due to its substantial lack of integrity.

Table of Contents

List of Figures

Appendices

Introduction
Horrocks Engineers requested that Project Engineering Consultants undertake a selective reconnaissance-level survey of historic architectural resources within the area of potential effects (APE) of a 62.9 acre parcel related to the Logan Wastewater Treatment Facility. The results of the survey are presented in this report.

A survey of archaeological resources was also undertaken, the results of which are reported under the title, "*An Archaeological Resources Inventory of the Logan Wastewater Treatment Facility Project, Logan, Cache County, Utah*" (Steele 2013).

Area of Potential Effects and Survey Area
This project's APE for architectural resources consists of a 62.9 acre (25.45 hectare) parcel located between the Logan Wastewater Treatment Facility in the north, 200 North in the south, 2200 West in the east and 2600 West in the west (see Figure 1). The APE also constitutes the survey area, within which a selective reconnaissance-level survey of historic buildings was undertaken (see Figures 2 and 3).

The APE is entirely within the Logan City limits and is owned by Logan City. The area is entirely agricultural and is used for cattle grazing. The Wastewater Treatment Facility lies to the north (see Figure 1).

Previous Research
PEC completed a file search of the project area using Utah Division of State History (UDSH) records on August 2, 2013. No previous projects or previously recorded properties were found within the APE. No properties within the APE are currently listed on the NRHP.

Methods
Peter Steele, PEC Cultural Resource Director, conducted a selective reconnaissance-level historical architecture survey of the APE on August 5, 2013 following State Historic Preservation Office (SHPO) Standard Operating Procedures for Reconnaissance-Level Surveys. The survey was selective in that it omitted buildings estimated or known to have been built after 1963, the cutoff date for consideration under this project. The survey followed UDSH standards. Each property meeting the age standard was photographed using a digital camera at 300 dpi resolution. Notes on the architectural features and attributes as well as any historic outbuildings were taken. Dates were determined by evaluating architectural styles, examining historic photographs and maps, and speaking with property owners. This information will be entered into the UDSH online PreservationPro database after approval of this report.

Figure 1. Typical view of project area, looking northwest.

Historical Context
The first Euroamericans to enter the valley were fur trappers from French, British, and American expeditions in the early 1800s. By the 1820s, the valley was often being used by trappers and was the setting of a rendezvous between trappers and merchants. Permanent settlement by Euroamericans did not take place until 1855 when Mormon settlers under the direction of Brigham Young established a cattle ranch near the Blacksmith Fork River. The ranch was abandoned the next year after a severe winter, but other Mormon settlers entered the valley in the fall of 1856. Logan, along with other settlements, was established in 1859 as increasing numbers of pioneers entered the valley. The city continued to develop and became the principal city and center of Cache Valley (Peterson 1997).

Figure 2. Area of Potential Effects. 1-foot HRO Aerial Photography.

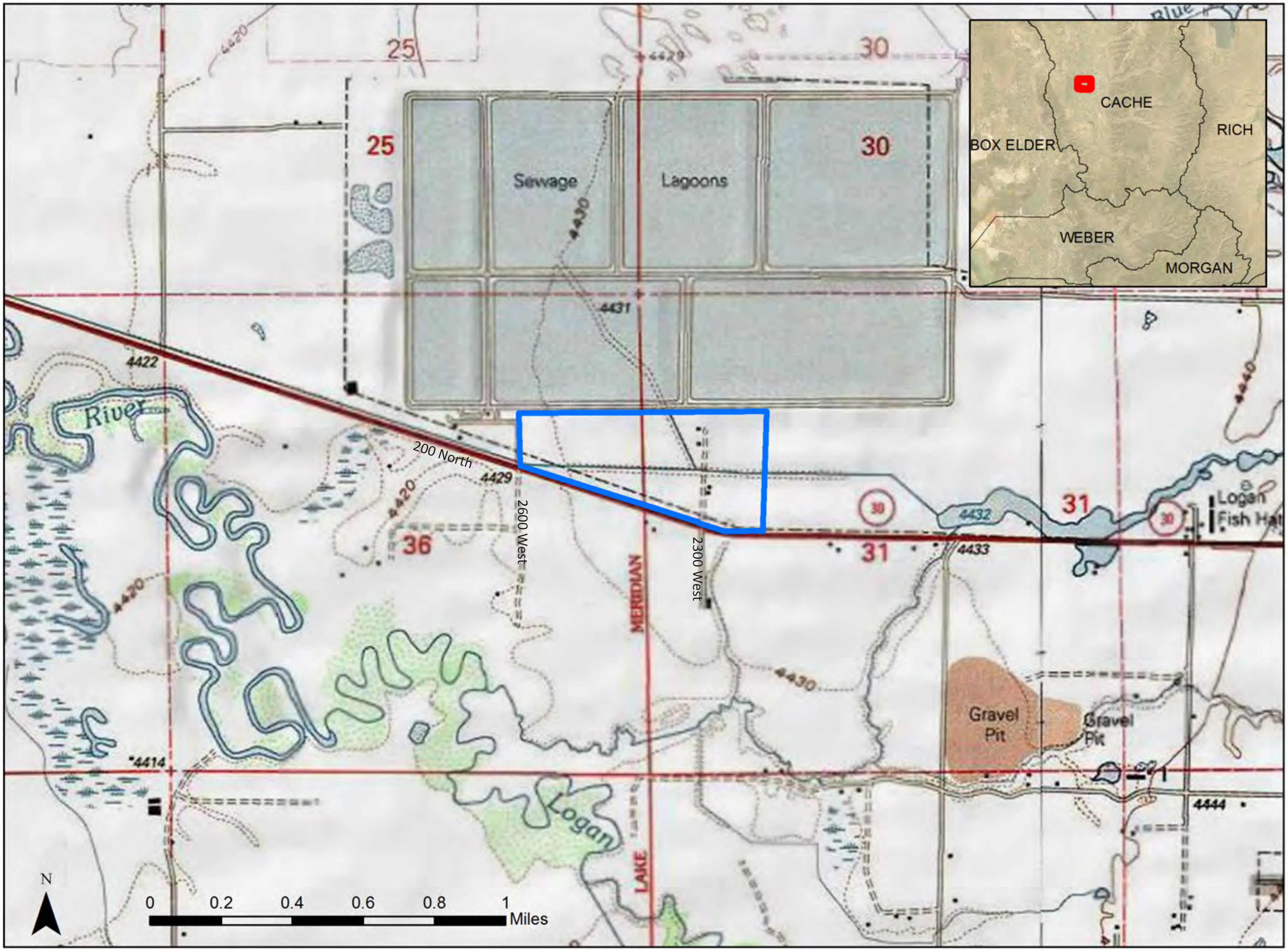


Figure 3. Area of Potential Effects. USGS 7.5' Topographic Maps Wellsville and Logan

Aerial photographs from 1937 show a possible barn north of the canal at 2300 West, and show the Cow Pasture Canal crossing the project area. USGS topographic maps from 1961 and 1962 show structures along 2300 West in the project area, as well as the canal.

Inventory Results and Evaluation

A total of one historic architectural property was identified through the selective reconnaissance-level survey. This property represents mid-twentieth-century, rural, agricultural development. A description of the building and an evaluation of its NRHP eligibility is provided below in the Survey Results section after a description of the criteria used to evaluate the eligibility of the properties.

Sections 36 CFR 800 and 36 CFR 60 (implementing regulations for the National Historic Preservation Act of 1966) and U.C.A. 9-8-404 (state Antiquities Act) establish the criteria under which all cultural resource sites, including historic buildings, are evaluated for eligibility for the NRHP. Sites are evaluated for integrity and significance.

The criteria which are evaluated to examine integrity of an historic property are location, design, setting, materials, workmanship, feeling, and association. There are also four significance criteria as follows. A property may be considered historic if it

A. is associated with events that have made a significant contribution to the broad patterns of our history; OR
B. is associated with the lives of persons significant in our past; OR
C. embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction; OR
D. yielded, or may be likely to yield, information important in prehistory or history.

A property must have significance under one of these four criteria, and retain integrity in those areas which are related to its significance to be considered eligible for the NRHP.

Utah-Specific Evaluation Criteria for Buildings

The Historic Preservation Office of the Utah Department of State History has developed an evaluation system to assist in the documentation and evaluation of large numbers of buildings in a reconnaissance survey. Four ratings categories have been defined to determine the degree to which the structures retain integrity. These ratings categories are as follows:

ES. Eligible/Significant: built within the historic period and retains integrity; excellent example of a style or type; unaltered or only minor alterations or additions; individually eligible for the NRHP under criterion C; also includes buildings of known historical significance.

EC. Eligible: built within the historic period and retains integrity; good example of a style or type, but not as well-preserved or well-executed as “ES” buildings; more substantial alterations or additions than “ES” buildings, though overall integrity is retained; eligible for the NRHP as part of a potential historic district or primarily for historical, rather than architectural, reasons (which may not be known at the time of the RLS inventory).

NC. Ineligible: built during the historic period but has had major alterations or additions; no longer retains integrity.

OP. Out-of-Period: built after the historic period.

The Utah-specific evaluation criteria interact with the National Register criteria. A property with a UDSH rating of

ES is likely to be eligible under criteria A and C because it would have a higher degree of integrity or represent a rarer building type within the study area. A property with a UDSH rating of EC is likely to be eligible only under criterion A for association with broad patterns of history.

Because this survey was selective, out-of-period buildings were not recorded, and the rating of "OP" does not apply. Because the buildings within the survey area are mostly from the same time period, a strict standard of integrity was used to judge eligibility for the NRHP. The integrity of a historic building was assessed in the context of the neighborhood, including whether changes are common in the survey area; how well a style is represented in the area; and the degree to which a building has been altered, including changes to fenestration or siding that do not conform to the appearance of fenestration or siding in use in the historic period. Changes to the massing of a structure by altering the roofline, building an addition, or building an attached garage also negatively impact the integrity of a building.

Historic Boundaries
Historical property boundaries must be established to allow for a reasonable assessment of the effect of a project on historic resources. Publications by the National Park Service (Seifert et al. 1997, Southworth 1987) provide guidance on establishing such boundaries with the following recommendations:

- Select boundaries that encompass the entire resource, including both historical and modern additions. Include surrounding land historically associated with the resource that retains integrity and contributes to the property's historic significance.

- Use the legally recorded parcel number or lot lines for urban and suburban properties that retain their historical boundaries and integrity.

- For small rural properties, select boundaries that encompass significant resources, including out buildings and the associated setting.

- For larger rural properties, select boundaries that include fields, forests, and open rangeland that is historically associated with the property and conveys the property's historical setting. The areas must have integrity and contribute to the property's historical significance.

For this APE, the third bulleted item above applies. The area surveyed is part of a rural agricultural area with no defined lot lines. Therefore, the property boundary was drawn to encompass all significant resources.


Figure 2. Property at 250 North 2300 West, view to northwest.

Survey Results
One property 50 years old or older was documented as part of the reconnaissance-level survey of the Area of Potential Effects. This property, located at approximately 250 North 2300 West, is a one-and-one-half story Agricultural: Other building of unknown use, exhibiting Vernacular style. It is clad in wooden novelty drop siding, and rests on a timber foundation. The interior was at one time clad in plaster and lathe although this has seriously deteriorated. Alterations are primarily due to neglect and include the collapse of a portion of the roof, the removal of windows and doors, and other damage. Although the building appears to be agricultural in nature, it could also have been used as a residence, or for another use. A nearby cattle pen and shed may be associated with this building and are considered a contributing outbuilding. The building has no associations with important events or persons in national, state,

or local history. It is not a good example of a style or type, and is unlikely to reveal any information if further investigated. PEC recommends that this building receive an non-contributing UDSH rating, and be considered **Not Eligible** for the NRHP. Appendix A contains maps showing the location of the property.

Summary and Recommendation

The single property recorded is an historical agricultural building representing the World War II to Post-World War II Era.

The property has been substantially modifiied through deterioration of the structure. PEC recommends that it receive a non-contributing UDSH rating and be considered Not Eligible for the NRHP. Because the property is recommended **Not Eligible**, any proposed project would result in a finding of **No Historic Properties Affected** for architectural resources.

References

Peterson, F. Ross
    1997 *A History of Cache County*. Utah State Historical Society, Salt Lake City.

Seifert, Donna, Barbara Little, Beth Savage, and John Sprinkle, Jr.
    1997 *National Register Bulletin 21: Defining Boundaries for National Register Properties.* National Park Service, Washington, D.C.

Southworth, Don
    1987 *Defining Boundaries for National Register Properties*. U.S. Department of the Interior, National Park Service, Washington, D.C.

Steele, Peter
    2013 *An Archaeological Resources Inventory for the Logan Wastewater Treatment Facility Project, Logan, Cache County, Utah.* Project Engineering Consultants, West Jordan, Utah.

Appendix A: Survey Results Maps

Figure A1. Results of Survey.

Appendix B:
Site Forms and Photos

HISTORIC SITE FORM

(3/12)

UTAH OFFICE OF HISTORIC PRESERVATION
For Section 106 Review Only
(This form does not replace the consultation letter or determination of eligibility/finding of effect)

1 IDENTIFICATION

Name of Property/Current Owner: Logan City
Address: Approximately 250 North 2300 West
City, County: Logan, Cache County
Tax Number: 05-057-0001
Legal Description (include acreage):

Twnshp: 12N *Range:* 1E *Section:* 31
Latitude/Longitude:
106 Case #:
Agency Project #:

2 STATUS/USE

Property Category
X *building(s)*
__ *structure*
__ *site*
__ *object*

Evaluation
__ *eligible/contributing*
X *ineligible/non-contributing*
__ *out-of-period*

Use (based on RLS data options)
Original Use: Agricultural
Current Use: Vacant

3 DOCUMENTATION

Photos: Dates
X *CD-Rom/prints:*
__ *historic:*

Drawings and Plans
__ *site sketch map*
__ *other:*

Research Sources (check all sources consulted, whether useful or not)
X *abstract of title*
__ *tax card & photo*
__ *building permit*
X *Sanborn Maps*
__ *other:*

4 ARCHITECTURAL DESCRIPTION (based on RLS data options)

Date of Construction: c. 1950
No. of Stories: 1.5
Building Type: Agricultural: Other
Building Style: Vernacular
Foundation Material: Wood
Wall Material(s): Wooden Novelty Drop Siding
Additions: X *none* __ *minor* __ *major (describe below)*
Alterations: __ *none* __ *minor* X *major (describe below)*
No. of contributing outbuildings and/or structures: 1
No. of non-contributing outbuildings and/or structures: 0

Briefly describe the principal building additions or alterations and their dates, and associated outbuildings and structures.

This property, located at approximately 250 North 2300 West, is one-and-one-half story Agricultural: Other building of unknown use, exhibiting Vernacular style. It is clad in wooden novelty drop siding and rests on a timber foundation. The interior was at one time clad in plaster and lathe although this has now seriously deteriorated. Alterations are primarily due to neglect and include the collapse of a portion of the roof, the removal of windows and doors, and other damage. A nearby cattle pen and shed may be associated with this building and are considered a contributing outbuilding.

5 HISTORY/PROPOSED ACTION

Describe the impending action (e.g., road widening, rehabilitation, alteration, demolition). Additional historical information is optional.

The proposed action may expand the Logan Wastewater Treatment Plant, which could lead to demolition of the building.

Researcher/Organization: Peter Steele/PEC, Inc.

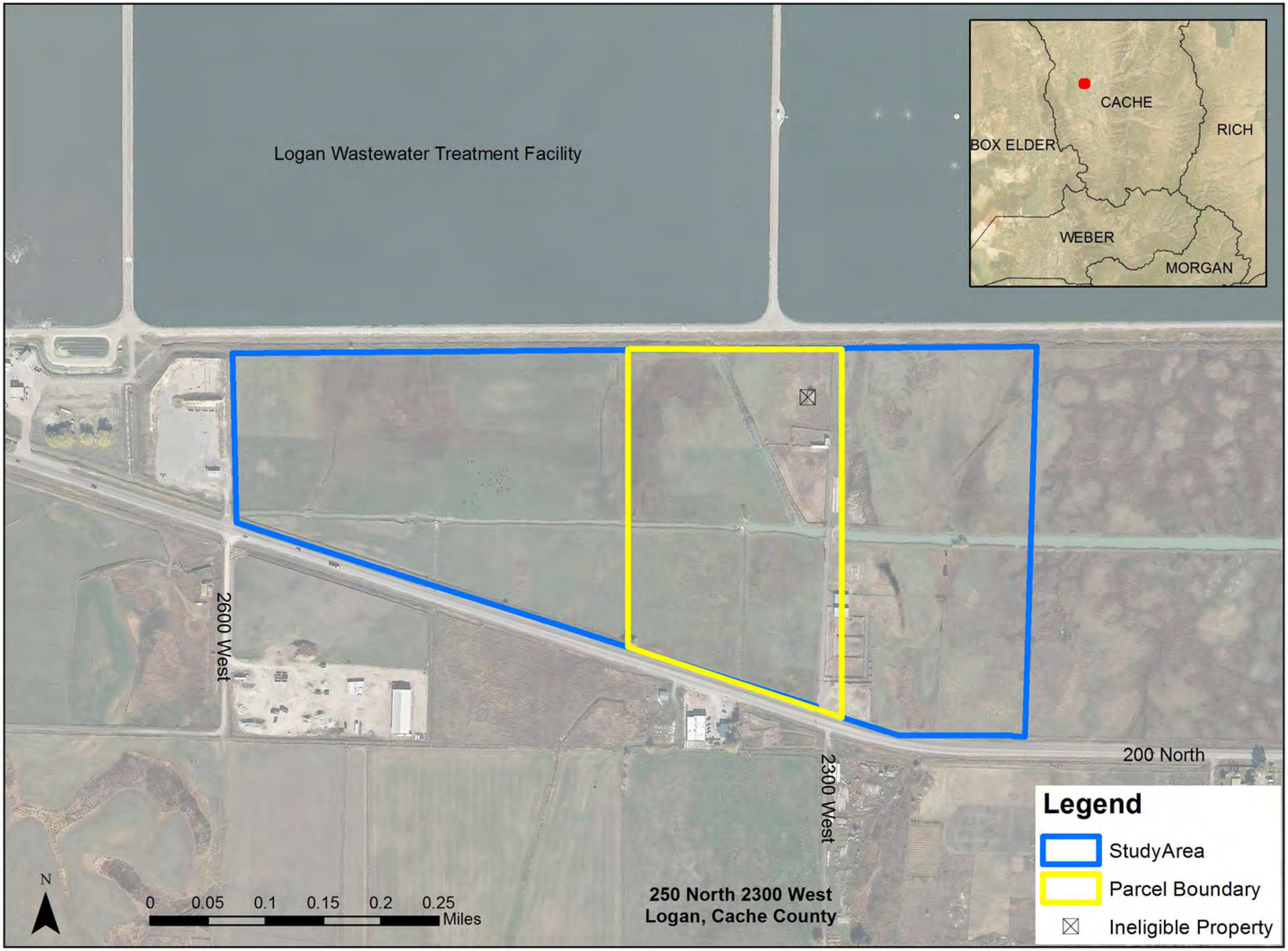
Documentation Date (mo/yr): 7/2013


250 North 2300 West, view to the north.


250 North 2300 West, view to the southeast.


250 North 2300 East - Cattle Sheds, view to northwest.


250 North 2300 East - Cattle Sheds, view to west.



Logan Wastewater Treatment Facility
CACHE
RICH
BOX ELDER
WEBER
MORGAN
2600 West
200 North
2300 West
Legend
StudyArea
Parcel Boundary
Ineligible Property
N
0
0.05
0.1
0.15
0.2
0.25
Miles
250 North 2300 West
Logan, Cache County

An Archaeological Resource Investigation

of the Logan Wastewater Treatment Facility Project

Logan, Cache County, Utah

Prepared for

Horrocks Engineers

Pleasant Grove, Utah

by

Peter Steele, M.A., RPA

Project Engineering Consultants, Ltd.

West Jordan, Utah

14 August 2013

Utah Antiquities Project No. U-13-ZP-0596

Utah PLPCO Permit No. 232

Abstract

In July 2013, Horrocks Engineers contracted with Project Engineering Consultants (PEC) to conduct a cultural resources inventory of a 62.9 acre (25.45 hectares) parcel between 200 North and the Logan Wastewater Treatment Facility in Logan, Cache County, Utah. The area surveyed consisted of a block of land bordered by the boundary fence for the Treatment Facility in the north, by 200 North in the south, by 2600 West in the west, and by approximately 2200 West in the east. The project area has been disturbed by agricultural use, particularly with cattle grazing and associated structures. The document search and field survey resulted in the observation of one site: 42CA178. Site 42CA178, the Cow Pasture Canal, runs through the center of the parcel from east to west and includes several secondary canals and ditches as well as several features such as diversion structures and culverts. This site has not been previously recorded and was documented as a new site. One isolated occurrence, a ditch without connection to the Cow Pasture Canal or any other ditch or canal, was also recorded. This report contains the results of these investigations.

Table of Contents

List of Figures

Appendices

Introduction

Project Engineering Consultants (PEC) has been contracted by Horrocks Engineers to prepare the cultural resources documentation needed to obtain a permit for impacts to wetlands south of the Logan Wastewater Treatment Facility. The area of potential effects (APE) pertaining to this project is an irregular parcel containing 62.9 acres (25.45 hectares) (see Figure 1). It lies between the boundary fence of the Treatment facility in the north and 200 North in the south, and between 2600 West in the west and approximately 2200 West in the East (see Figure 2). The project is located in Section 31 of Township 12 North, Range 1 East, and in Section 36 of Township 12 North, Range 1 West. An architectural survey was undertaken and is reported under a separate cover (see *A Selective Reconnaissance-Level Survey of Architectural Resources for the Logan Wastewater Treatment Facility Project*, Steele 2013).

Project Area Setting

The geographic setting for the project area is in the Cache Valley subdivision of the Middle Rocky region (Stokes 1977). Elevations in this location range from approximately 1,351 meters to 1,353 meters (4,432 feet to 4,440 feet) above sea level. The project area is at its highest in the east and descends very gradually to the west. Soils at this location have been somewhat disturbed and compromised through historic agricultural use (see Figure 1). The site showed evidence of recent use as pasture. Vegetation in the project area is made up primarily of grasses and forbs such as redroot pigweed (*Amaranthus retroflexus*), common teasel (*Dipsacus fullonum*), sowthistle (*Sonchus* sp.), and cheatgrass (*Bromus tectorum*), with wetland plants such as common reed (*Phragmites australis*) in wetter areas.

Figure 1. Overview of the project area, view to the northwest.

Historic Context

Relatively little evidence of paleoindian groups using the Cache Valley exists. The Fremont culture may have used the valley up until approximately 1300 AD, and following that period, the valley was used on a seasonal basis by nomadic, primarily Shoshonean, Native American groups. The first Euroamericans to enter the valley were fur trappers from French, British, and American expeditions in the early 1800s. By the 1820s, the valley was often used by fur trappers and was the setting of a rendezvous between trappers and merchants. Permanent settlement by Euroamericans did not take place until 1855 when Mormon settlers under the direction of Brigham Young established a cattle ranch near the Blacksmith Fork River. The ranch was abandoned the next year after a severe winter, but other Mormon settlers entered the valley in the fall of 1856. Logan, along with other settlements, was established in 1859 as increasing numbers of pioneers entered the valley. The city continued to develop and became the principal city and center of Cache Valley (Peterson 1997). Aerial photographs from 1937 show the Cow Pasture Canal and show a possible barn north of the canal at 2300 West. USGS topographic maps of the project area from 1961 and 1962 show structures along 2300 West as well as the canal.

Previous Research

A literature search was conducted August 2, 2013 on the Utah Division of State History's online database, PreservationPro to identify previously documented archaeological sites or areas of historic importance. The literature search found no previously filed cultural resource reports. No sites have been previously recorded. GLO

Figure 2. Project Area, 1-foot Aerial Photography

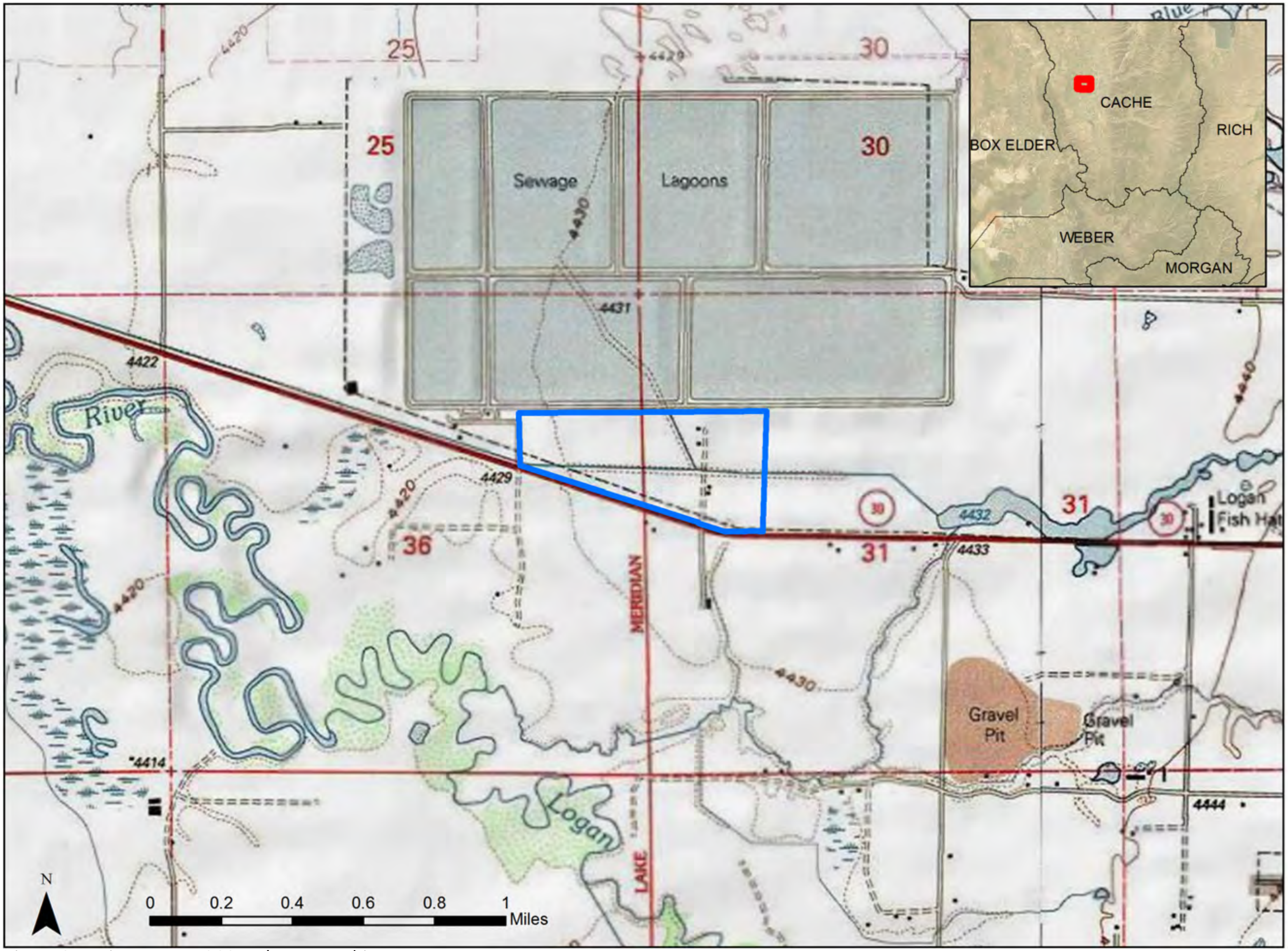


Figure 3. Project Area, USGS 7.5' Topographic Map Magna

plat maps from the Bureau of Land Management were reviewed, with maps from 1856, 1877, and 1908 available for the project area. The 1877 map shows 200 North, labeled as County Road, running near its present alignment. No other features are shown in or near the project area. The USGS 7.5' topographic maps for the Logan (1961) and Wellsville (1962) quadrangles showed 200 North, a dirt road leading to a structure at 2300 East, and Site 42CA178, a canal not named on the topographic map, crossing the project area.

Methods

Peter Steele, PEC Cultural Resources Director, conducted an intensive-level pedestrian inventory of the project area on August 5, 2013 (see Figures 2 and 3). The inventory was conducted according to U.S. Army Corps of Engineers (USACE) guidelines using a 15-meter survey transect throughout the project area (USACE 2011). Topographic maps, aerial photographs, a compass, and a GPS unit were used to confirm location of the survey area and transects. Sites were recorded according to USACE guidelines. Utah Professional Archaeological Council guidance was also considered for linear sites (UPAC 2008). Other cultural resources were recorded as isolated occurrences (IO).

Results

The survey identified one archaeological site in the project area, 42CA178, the Cow Pasture Canal (see map in Appendix A). One isolated occurrence, an earthen ditch with no connection to a larger network, was also identified.

42CA178

Site 42CA178 is the Cow Pasture Canal (see Figure 4). The canal is fed by a set of springs located approximately 1,126 meters (3,700 feet) east-southeast of the portion of the site recorded by this project, near the Logan Fish Hatchery. The canal runs to the west, eventually emptying into Cutler Reservoir near the confluence of the Little Bear and Logan Rivers, for a total distance of approximately 3.35 miles. In the area of the survey, the site includes the main canal, two secondary canals, and four earthen ditches. At one time, a branch of the canal (Canal 2 on the map in Appendix A) ran to the northwest, but the majority of this branch has been demolished or rerouted by construction of the Logan Wastewater Treatment Facility. Another branch is shown on topographic maps running east from the source area, then south along 1000 West. This portion of the site was not examined as part of this project. The canal company (the Logan Cow Pasture Water Company) was incorporated in 1902, and the canal was built shortly thereafter as part of a larger push to irrigate portions of Cache Valley (Cardon n.p.). It runs for approximately 3.34 miles between its source and Cutler Reservoir. The main canal consists of an earthen channel with somewhat irregular, vegetated banks (see Figure 4). It measures approximately 8 meters (26 feet) across at the top east of the diversion into Canal 3 (see Figure 6). West of Canal 3, the site measures 3.5 meters (12 feet) in width. Due to the large amount of water in the canal, the depth and bottom were not ascertained. The canal showed signs of recent dredging, showing that it is currently maintained. Other features of the canal, including two secondary canals, four earthen ditches, and eight irrigation-related features within the canals, are listed below:


Figure 4. Site 42CA178, Main Canal, view to the east.

Canal 2 - An earthen canal measuring 6 meters (20 feet) across the top, 3.5 meters (11.5 feet) across the bottom, and 1.5 meters (5 feet) deep (see Figure 5). It runs northwest from the main canal, with a short offshoot to the west at the fence line.


Figure 5. Site 42CA178, Canal 2, view to the northwest.


Figure 6. Site 42CA178, Canal 3, view to the south.


Figure 7. Site 42CA178, Ditch 3, view to the south.


Figure 8. Site 42CA178, Ditch 4 and Feature 1, view to the south.


Figure 9. Site 42CA178, Ditch 5, view to the southeast.


Figure 10. Site 42CA178, Feature 2, view to the east.

Figure 11. Site 42CA178, Feature 3, view to the east.

Figure 12. Site 42CA178, Feature 4, view to the northwest.

Figure 13. Site 42CA178, Main Canal, Feature 5, view to the west.

Figure 14. Site 42CA178, Feature 6, view to the southwest.

Figure 15. Site 42CA178, Feature 7, view to the north.

Figure 16. Site 42CA178, Feature 8, view to the south.

Canal 3 - An earthen canal measuring 2 meters (6.5 feet) across the top, with an unknown bottom width and depth due to water (see Figure 6). It runs south from the main canal just west of the junction with Canal 2. Water is diverted into the canal by a concrete and board diversion structure (see Feature 3 below).

Ditch 2 - An earthen ditch measuring 1.5 meters (5 feet) across, and 0.33 meters (1 foot) deep. It runs northeast from the main canal, just east of 2300 West.

Ditch 3 - An earthen ditch measuring 1.5 meters (5 feet) across the top, 0.75 meters (2.5 feet) across the bottom and 1 meter (3 feet) deep (see Figure 7). It runs south from a concrete and board diversion structure at approximately 2500 West.

Ditch 4 - An earthen ditch measuring 2.5 meters (8 feet) across the top, 1 meter (3 feet) across the bottom and 0.33 meters (1 foot) deep (see Figure 8). The ditch appears to carry overflow water from the Wastewater Treatment Facility into the main canal, although at the time of survey the ditch was dry.

Ditch 5 - An earthen ditch measuring 1.25 meters (4 feet) across the top, 0.5 meters (1.5 feet) across the bottom, and 0.75 meters (2.5 feet) deep (see Figure 9). It runs southeast from the main canal at 2600 West, paralleling 200 North. It also intersects Ditch 3 near 200 North.

Feature 1 - Feature 1 is the concrete headwall, wingwalls, and drain connecting Ditch 4 to the main canal (see Figure 8). It measures approximately 7 meters (22 feet) in length.

Feature 2 - Feature 2 is the square diversion structure, made of concrete and board, which diverts water from the main canal into Ditch 3 (see Figure 10). It also measures approximately 7 meters (22 feet) in both length and width. The diversion structure also causes a height difference in main canal from east to west, causing a drop off to the west.

Feature 3 - Feature 3 is the diversion structure, made of concrete and board, which diverts water from the main canal into Canal 3 (see Figure 11). The main canal narrows significantly after this feature. The feature measures 4 meters (13 feet) in width and 8 meters (27 feet) in length, and includes a concrete box and concrete wingwalls.

Feature 4 - Feature 4 is a corrugated metal culvert in Canal 3 (see Figure 12). Gravel and dirt have been poured around the culvert in order to create a vehicle crossing. The crossing is approximately 3 meters (10 feet) wide, and appears, from an examination of aerial photography, to have been placed within the last two years.

Feature 5 - Feature 5 is a single corrugated metal culvert carrying a dirt and gravel road (along the alignment of 2300 West) across the main canal (see Figure 13). Dirt and gravel have been placed around the culvert to create the driving surface. The width of the crossing is approximately 8.5 meters (28 feet).

Feature 6 - Feature 6 is a concrete channel of unknown purpose in Canal 2, north of Canal 2's junction with the main canal (see Figure 14). The feature was disturbed by a heavy growth of reeds, but appeared to form a kind of spillway. Measurements could not be taken.

Feature 7 - Feature 7 is a diversion structure made of concrete at the northwest end of Canal 2 (see Figure 15). Water can be channeled either into a narrow ditch paralleling the Wastewater Treatment Facility boundary fence on the south or into a larger ditch north of the fence. The structure measures 8 meters (26 feet) in width.

Feature 8 - Feature 8 is a concrete pipe with a metal cover on the south side of the main canal, east of 2300 West (see Figure 16). Its purpose appears to be to allow water into the adjacent pasture during times of high flow. The diameter of the pipe is approximately 0.33 meters (1 foot).

The Cow Pasture Canal retains good integrity. Maintenance of the canal is in harmony with its historic use and has not altered it to any great degree. The features, the diversions made of concrete and the corrugated metal culvert generally appeared to be in good repair and may be replacements of earlier structures. The canal was a late addition to the Cache Valley irrigation system and uses a small amount of spring water to irrigate approximately 1,800 acres (Kimball 1922). As such, it is not an important contributor to agricultural or other development of Logan or Cache County, and is not associated with other important trends or events in local, regional, or national history. It also has no association with important persons, does not represent a particular style or solve a difficult engineering problem in the area observed, and would not yield important information if excavated. It is recommended that the site be determined **not eligible** for the National Register of Historic Places.

Isolated Occurrence I

Isolated Occurrence I (Figure 17) consists of an earthen ditch running from 200 North, 212 meters (695 feet) east of 2300 West, north and northeast to a modern livestock watering area. The watering area consists of a tractor tire with a water tap creating a small pool. The ditch, which has no apparent connection to any other ditches or canals, may be a result of or an attempt to channel runoff water from this feature. The ditch measures 0.75 meters (2.5 feet) across and 0.33 meters (1 foot) deep.

Figure 17. Isolated Occurrence 1, view to the north.

Conclusion

The literature search conducted for this project identified no previously recorded archaeological sites in or near the project area APE. The intensive-level pedestrian survey noted one previously unrecorded site, 42CA178, as well as one isolated occurrence. PEC recommends that site 42CA178 be considered **not eligible** for the National Register of Historic Places.

Works Cited

Cardon, Wayne R.

Not Published   Personal Communication to the Author, August 13, 2013.

Kimball, James N.

1922   *In the District Court of the First Judicial District of the State of Utah in and for the County of Cache. Utah Power & Light Company vs. Richmond Irrigation Company : Final decree.* First District Court, Logan, Utah.

Peterson, F. Ross
1997 *A History of Cache County*. Utah State Historical Society, Salt Lake City.

United States Army Corps of Engineers (USACE)
2011 "Guidelines for Compliance with Section 106 of the National Historic Preservation Act ." U.S. Army Corps of Engineers, Sacramento District, Sacramento, CA.

Utah Professional Archaeological Council
2008 "Linear Sites: Guidance for Identifying and Recording under Section 106 of the National Historic Preservation Act."

Appendix A:
Survey Results Map

Map Removed

Appendix B:
Paleontological Clearance

GARY R. HERBERT
Governor

GREG BELL
Lieutenant Governor

State of Utah

DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER
Executive Director

Utah Geological Survey

RICHARD G. ALLIS
State Geologist/Division Director

August 6, 2013

Peter Steele
Project Engineering Consultants
986 West 9000 South
West Jordan UT 84088

RE: Paleontological File Search and Recommendations for the Logan Wastewater Treatment Facility Project, Cache County, Utah
U.C.A. 79-3-508 compliance; literature search for paleontological specimens or sites

Dear Peter:

I have conducted a paleontological file search for the Logan Wastewater Treatment Facility Project in response to your email of August 6, 2013.

There are no paleontological localities recorded in our files for this project area. Quaternary and Recent alluvial deposits that are exposed here have a low potential for yielding significant fossil localities (PFYC 1 - 2). Unless fossils are discovered as a result of construction activities, this project should have no impact on paleontological resources.

If you have any questions, please call me at (801) 537-3311.

Sincerely,

Martha Hayden

Martha Hayden
Paleontological Assistant

APPENDIX B

Logan City
Wastewater Treatment Facility
Threatened & Endangered Species
Effects Determination Report
Cache County, Utah

Prepared by:

Horrocks Engineers
2162 West Grove Parkway, Suite 400
Pleasant Grove, Utah
Contact: Ryan Pitts

October 2015

Introduction

Logan City owns and operates a lagoon wastewater treatment facility to filter and clean approximately 15 million gallons of wastewater each day. The facility currently treats wastewater from Logan, Nibley, Providence, River Heights, North Logan, and Smithfield. The lagoons operate as a passive system that filters out solid wastes and harmful chemicals before discharging the effluent for irrigation use.

The Environmental Protection Agency (EPA) recently released new standards that must be met by 2020 for the levels of phosphorus and ammonia that can be released in the filtered/cleaned water. The current lagoon wastewater treatment facility cannot achieve the new EPA standards. Therefore, Logan City is planning to construct a mechanical wastewater treatment facility to reduce phosphorus and ammonia to acceptable levels.

The purpose of this report is to make an effects determination on whether the proposed project would impact federally-listed species in accordance with the Endangered Species Act (ESA) of 1973 (7 U.S.C. 136, 16 U.S.C. 1531 et seq.), as amended.

Proposed Action

The proposed action would construct a three-stage Bardenpho bio-reactor mechanical treatment facility. This alternative was identified as most practicable and cost effective treatment process for phosphorus and ammonia over a 20-year life cycle. Construction methods for the facility include pre-loading the site with imported fill material, excavation, grading, utility installation, and facility construction.

Project Area

The project area is approximately 63 acres, bounded by the Logan Wastewater Treatment Facility on the north, 200 North on the south, 2200 West on the east, and 2600 West on the west. At this time it is estimated that only about 30 acres of the site would be disturbed by either re-grading or construction. The remaining land would remain undisturbed.

Species

On October 26, 2015, an official species list was obtained from the USFWS' Information Planning and Conservation (IPaC) database. The official species list identified the yellow-billed cuckoo, the Ute ladies'-tresses, and the Canada lynx as potentially being present in the project area, but did not identify any critical habitats for any of those species within the project area.

Table 1. Threatened, Endangered, and Candidate Species Protected Under the ESA

Common Name	Scientific Name	Status
Ute Ladies' Tresses	*Spiranthes diluvialis*	Threatened
Canada Lynx	*Lynx canadensis*	Threatened
Yellow-billed Cuckoo	*Coccyzus americanus*	Threatened

Source: U.S. Fish and Wildlife Service Official Species List dated October 26, 2015

The following species accounts and descriptions are from the Utah Conservation Data Center, a part of the Utah Division of Wildlife Resources (UDWR 2013).

Ute Ladies' Tresses

Ute ladies'-tresses, *Spiranthes diluvialis*, is a Federally listed threatened plant that occurs in Cache, Daggett, Duchesne, Garfield, Juab/Tooele, Uintah, Utah, Wasatch and Wayne counties, Utah, and is known historically from Salt Lake and Weber counties. It also occurs in the states of Colorado, Idaho, Montana, Nebraska, Nevada, Washington, and Wyoming and in the Canadian province of British Columbia. A member of the orchid family, this species is a perennial herb with a flowering stem, 20-50 cm tall that arises from a basal rosette of grass-like leaves. The flowers are ivory-colored, arranged in a spike at the top of the stem, and bloom mainly from late July through August. Ute ladies'-tresses is found in moist to very wet meadows, along streams, in abandoned stream meanders, and near springs, seeps, and lake shores. It grows in sandy or loamy soils that are typically mixed with gravels. In Utah, it ranges in elevation from 1311 to 2134 meters. The riparian habitats in which this species occurs have been drastically modified by urbanization and stream channelization for agriculture and development. Most surviving populations are small and appear to be relict in nature.

Canada Lynx

The Canada lynx, *Lynx canadensis*, is a medium-sized cat that is listed as a sensitive species by the Utah Division of Wildlife Resources, and as a threatened species by the U.S. Fish and Wildlife Service. The range of *Lynx canadensis* extends from Canada and Alaska south to Maine, the Rocky Mountains, and the Great Lakes region. Although sightings of the Canada lynx in Utah over the past twenty years are exceedingly rare, the U.S.D.A. Forest Service recently announced that Canada lynx hair was found in the Mani-La Sal National Forest during 2002.

The preferred habitat of the Canada lynx is montane coniferous forest. Alteration of this habitat, through logging, clearing, and road construction, represents the largest current threat to Canada lynx populations. The Canada lynx is nocturnal and its major food source is the snowshoe hare, *Lepus americanus*. The Canada lynx breeds from late winter to early spring, with an average litter size of three or four.

Yellow-billed Cuckoo

Currently, the range of the yellow-billed cuckoo is limited to disjunct fragments of riparian habitats from northern Utah, western Colorado, southwestern Wyoming, and southeastern Idaho southward into northwestern Mexico and westward into southern Nevada and California. Cuckoos are long-range migrants that winter in northern South America in tropical deciduous and evergreen forests. The current distribution of yellow-billed cuckoos in Utah is poorly understood, though they appear to be an extremely rare breeder in lowland riparian habitats statewide. Yellow-billed cuckoos are considered a riparian obligate and are usually found in large tracts of cottonwood/willow habitats with dense sub-canopies (below 10 m [33 ft]).

Yellow-billed cuckoos are one of the latest migrants to arrive and breed in Utah. They arrive in extremely late May or early June and breed in late June through July. Cuckoos typically start their southerly migration by late August or early September. Yellow-billed cuckoos feed almost entirely on large insects that they glean from tree and shrub foliage. They feed primarily on caterpillars, including tent caterpillars. They also feed frequently on grasshoppers, cicadas, beetles, and katydids, occasionally on lizards, frogs, and eggs of other birds, and rarely on berries and fruits.

Methodology

On July 18, 2013, Ryan Pitts and Nicole Tolley with Horrocks Engineers surveyed the areas associated with the proposed project. Specifically, presence/absence surveys were conducted for federally-listed ESA species within the full project area. In addition, vegetation type, hydrology, soil characteristics, and general biological observations were recorded throughout.

Furthermore, exact species localities of federally-listed ESA species known to occur within and adjacent to the project area were obtained from the Utah Natural Heritage Program's (UNHP) database.

Findings

The project area contains pastures and hayed areas that include uplands, mesic/alkali areas, some wetlands, a canal, and associated lateral ditches. The wetlands in the project area are primarily the result of many years of flood irrigation with a prominent restrictive clay layer 12 to 18-inches deep. At this time, the practice of flood irrigating the site has been eliminated, as the land was recently acquired by Logan City in anticipation of the wastewater treatment facility and the wetlands have greatly diminished over this past growing season.

There were no observations or evidence (scat, tracks, sightings) of the presence of any ESA species listed above during survey activities. Nor were there observations of suitable habitat for any of the ESA species. Finally, UNHP data did not reveal the presence of any federally-listed ESA species in the project area. On July 18, 2013, a ULT survey was conducted for the entire project area. Although no ULT individuals were discovered, the survey revealed the presence of marginal habitat within the proposed project area.

Conclusion

Based on field observations, presence/absence surveys, suitable habitat requirements, UNHP and USFWS data, and the scope of the project, it has been determined that the proposed project would have **no effect** on the federally-listed Canada lynx and the yellow-billed cuckoo. In regards to ULTs, presence/absence surveys discovered no ULT individuals within the project area and the UNHP has no recorded observations of ULT individuals within ½ mile of the proposed wastewater treatment facility. The survey indicated that the project area does not contain suitable ULT habitat due to a lack of sufficient hydrological conditions. Based on this information, the scope of the project, the lack of suitable habitat, and the potential for undiscovered dormant ULT individuals, the proposed project would have **no effect** on ULTs.

References

U. S. Fish and Wildlife Service. 2013a. Federally Listed and Proposed Endangered, Threatened and Candidate Species and Critical Habitat in Utah - County List by Species. Updated April 2, 2013. Accessed August 29, 2013. Retrieved from http://www.fws.gov/utahfieldoffice/Documents/Lists/County%20per%20Species.pdf.

U. S. Fish and Wildlife Service. 2013b. FWS Critical Habitat for Threatened & Endangered Species, Critical Habitat Portal. Accessed August 29, 2013. Retrieved from http://criticalhabitat.fws.gov/crithab/.

U.S. Fish and Wildlife Service. 2015. List of Threatened and Endangered Species That May Occur in Your Proposed Project Location, and/or May Be Affected by Your Proposed Project. Consultation Code 06E23000-2016-SLI-0016. Dated October 26, 2015. Retrieved from the USFWS Information Planning and Conservation (IPaC) system.

Utah Division of Wildlife Resources. 2013. Utah Conservation Data Center, Learn About Utah's Species. Accessed August 29, 2013. Retrieved from http://dwrcdc.nr.utah.gov/ucdc/default.asp.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Utah Ecological Services Field Office
2369 WEST ORTON CIRCLE, SUITE 50
WEST VALLEY CITY, UT 84119
PHONE: (801)975-3330 FAX: (801)975-3331
URL: www.fws.gov; www.fws.gov/utahfieldoffice/

Consultation Code: 06E23000-2016-SLI-0016 October 26, 2015
Event Code: 06E23000-2016-E-00039
Project Name: Logan WWTF

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment

Official Species List

Provided by:

Utah Ecological Services Field Office
2369 WEST ORTON CIRCLE, SUITE 50
WEST VALLEY CITY, UT 84119
(801) 975-3330
http://www.fws.gov
http://www.fws.gov/utahfieldoffice/

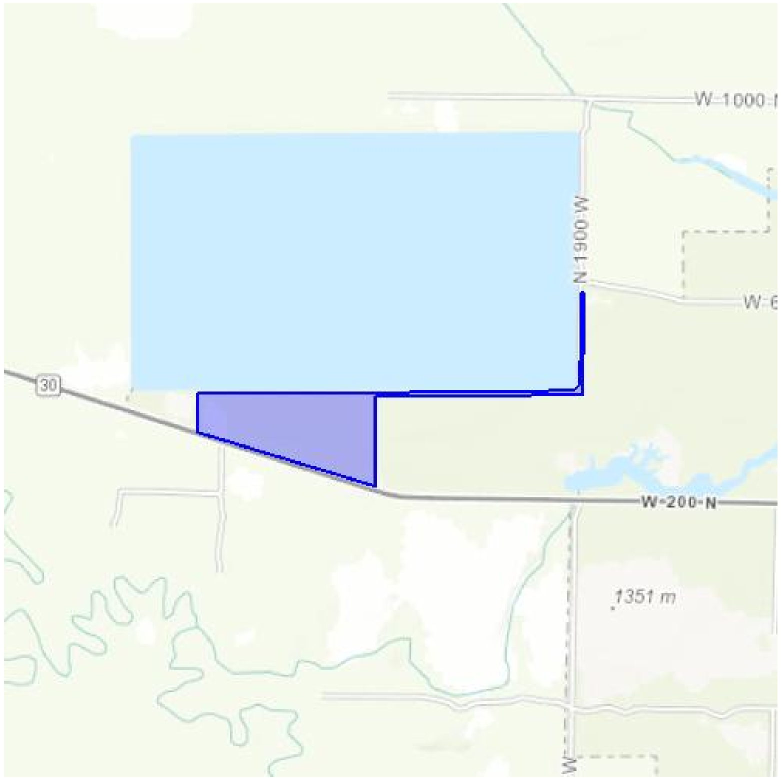
Consultation Code: 06E23000-2016-SLI-0016
Event Code: 06E23000-2016-E-00039

Project Type: WASTEWATER FACILITY

Project Name: Logan WWTF
Project Description: The City of Logan (City) owns and operates a lagoon system that provides wastewater treatment for the city and the surrounding communities of Hyde Park, Nibley, North Logan, Providence, River Heights, and Smithfield, as well as Utah State University. The purpose of the project is to provide wastewater treatment facilities capable of complying with the new environmental effluent standards for phosphorus and ammonia.

Please Note: The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.

Project Location Map:



Project Coordinates: MULTIPOLYGON (((-111.87919221450585 41.74054876470663, -111.87921328709672 41.739798298872856, -111.88942848749302 41.739764644459704, -111.88942431669133 41.736412341695875, -111.89445171097859 41.73755058278352, -111.89818636763795 41.73844368165097, -111.89821794240231 41.73986146805671, -111.88426478469522 41.7399103175038, -111.87969456712801 41.739970626339634, -111.87958662209824 41.74000433053529, -111.87940296799617 41.740145481803616, -111.87935916186849 41.74026950010072, -111.87928281886674 41.74354290794627, -111.87912700377979 41.74355056381957, -111.87919221450585 41.74054876470663)))

Project Counties: Cache, UT

Endangered Species Act Species List

There are a total of 3 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Birds	Status	Has Critical Habitat	Condition(s)
Yellow-Billed Cuckoo *(Coccyzus americanus)* Population: Western U.S. DPS	Threatened	Proposed	
Flowering Plants			
Ute ladies'-tresses *(Spiranthes diluvialis)*	Threatened		
Mammals			
Canada Lynx *(Lynx canadensis)* Population: Contiguous U.S. DPS	Threatened	Final designated	

Critical habitats that lie within your project area

There are no critical habitats within your project area.

APPENDIX C

Wetland Delineation and Waters of the U.S. Report

in support of

Logan Wastewater Treatment Facility

Logan City
Cache County
Utah

Prepared by:

Horrocks Engineers
2162 West Grove Parkway, Suite 400
Pleasant Grove, UT 84062

August 2013

Table of Contents

Introduction

The City of Logan is in the process of designing a proposed wastewater treatment facility and will need to consider potential impacts to wetlands and waters of the U.S. as per Section 404 of the Clean Water Act. Section 404 regulates the discharge of dredged or fill material into navigable waters, which has been defined by the Clean Water Act to include wetlands and tributaries. It is likely that the proposed improvements will have some impacts to wetlands and/or waters of the U.S. and a Section 404 permit will need to be obtained.

Horrocks Engineers has prepared this wetland delineation and waters of the U.S. report in support of the proposed Logan Wastewater Treatment Facility in Cache County, Utah. The delineation study area is approximately 62.9 acres and is located in Section 36 of Township 12 North, Range 1 West and Section 31 of Township 12 North, Range 1 East. The study area is relatively flat and at approximately 4,430' in elevation. For a project location map see Appendix A.

In the fall of 2012, Sherman Jensen of White Horse Associates conducted a preliminary wetland delineation of the same delineation study area. His results have been recorded in the report *Preliminary Wetland Delineation Logan Wastewater Expansion Area Cache County, Utah*, located in Appendix D. In the preliminary wetland delineation, Sherman Jensen concluded that "areas exhibiting wetland characteristics (are) sustained solely by application of irrigation water (and) are not regulated under Section 404 of the Clean Water Act". On December 5, 2012 Hollis Jencks of the U.S. Army Corps of Engineers (USACE) Bountiful Regulatory Office visited the site and recommended that irrigation water be diverted away from the delineation study area and that another site visit should be conducted in the Spring of 2013.

On July 8, 2013 Hollis Jencks returned for a follow-up site visit. The site visit revealed a very dry delineation study area. Hollis acknowledged that the areas identified in the preliminary wetland delineation as mesic/alkali meadow did not meet the required three parameters to be considered wetland and that the areas previously identified as irrigated wet meadow likely had decreased in acreage since the preliminary delineation was performed. Hollis requested that a new wetland delineation be performed in an effort to determine the change in wetland boundaries and to prepare a report that met the USACE Minimum Standards for Acceptance, specifically the standard to provide paired data points.

The purpose of this report is to supplement and finalize the Preliminary Wetland Delineation previously completed by White Horse Associates.

Methodology

Horrocks Engineers conducted this delineation in accordance with the U.S. Army Corps of Engineers' (USACE) *1987 Wetland Delineation Manual* (USACE 1987) and the *Regional Supplement: Arid West Region Version 2* (USACE 2008). These manuals require evidence of three parameters to identify and delineate a wetland - a dominance of hydrophytic vegetation, hydric soils, and wetland hydrology. All three parameters must be present for a wetland to be considered potentially jurisdictional. While onsite, Horrocks also evaluated all drainages within the delineation study area for evidence of an ordinary high water mark in an effort to identify and map all waters of the U.S.

First, plant species located within a sample point were recorded. The percent of relative cover for each species was determined by estimating aerial cover. The indicator status of each species was determined by using the National Wetland Plant List (USACE 2012). If a plant species comprised at least twenty percent of the total aerial cover in its stratum, it was considered to be a dominant plant species. If more than fifty percent of the dominant plant species had an indicator status of obligate wetland species (OBL), facultative wetland species (FACW), or facultative species (FAC), the sample point met the wetland vegetation parameter (USACE 2008).

Next, a soil pit was dug to a depth of 18 inches at the sample point to assess soil characteristics. After the pit was dug, a soil profile was sliced off using a soil spade. This profile was used to determine soil color, texture, and moisture at different depths within the soil profile. Color was determined by comparing a moistened soil sample with the Munsell Soil Color Charts (Munsell 2000). Soil texture and moisture was determined by feeling the soil samples. If the soil characteristics met the hydric soil criteria provided in the Arid West Region Supplement (USACE 2008) and the Field Indicators of Hydric Soils manuals (USDA 2006), the sample point met the wetland soils parameter.

Finally, the sample point and soil pit were examined to determine whether they met the wetland hydrology criteria. Field indicators of periodic saturation and/or inundation include redox features, drainage patterns in the wetland, sulfur odor, gleyed soils, soils with low chroma, sediment deposits, salt crust, surface soil cracks, or water stained leaves. If at least one primary indicator or two secondary indicators were present, the sample point met the wetland hydrology parameter.

If a sample point met all three parameters, it was classified as occurring in a wetland. Sample points were paired to more accurately delineate the wetland/upland boundary. The team used vegetative patterns, soil data, topography, and hydrology to guide the delineation of the wetland boundaries. Wetland boundaries and waters of the U.S. were mapped using a handheld Trimble GeoExplorer XT global positioning system receiver.

Discussions covered in the previous work performed by White Horse Associates and where conditions have not changed, have not been repeated in this report. The complete Preliminary Wetland Delineation prepared by White Horse and Associates is located in Appendix D. Specifically, the following discussions have not been repeated: directions to the site, plant communities, and soils descriptions.

Existing Field Conditions

On July 18, 2013, the day of the field visit to conduct the delineation, the high temperature was 96 degrees and the low was 59 degrees. These temperatures are higher than the averages for July 18 of 90 degrees and 55 degrees. Weather data shows that Logan received 0.31 inches of precipitation for the entire month of July, a -0.41 inch departure from normal. June had no measureable precipitation (AccuWeather 2013). Overall, the region has experienced below average precipitation amounts for the past year and the Palmer Hydrological Drought Index shows that this region has and is experiencing severe to extreme drought (NOAA 2013). As a result, the delineation study area was very dry, even in areas where saturation of soils would be expected. In addition to dry weather conditions, Logan City has completely eliminated the flood irrigation of the delineation study area. The dry conditions have not persisted long enough to alter the dominant vegetation across the delineation study area.

Hydrology

As previously stated, all irrigation water has been diverted away from the site; however, some irrigation channels that cross the delineation study area remain in use to convey water to downstream water right users. The canals and ditches still in use have been identified on the maps located in Appendix A. On the day of the field visit water was only present in the canals and ditches still in use. No standing water was observed elsewhere on the site.

Contact Information for the Applicant and Owner

The applicant and owner for this project are the same agency:

Logan City
Attn: Issa A Hamud, P.E., City Logan Environmental Director
Logan, Utah
Ph. (435) 716-9752
Issa.Hamud@loganutah.org

Contact Information for Design Engineers

Carollo Engineers
Clint Rogers, P.E.
1265 East Fort Union Blvd, Suite 200
Midvale, UT 84047
Ph. (801) 223-2525
CRogers@carollo.com

Contact Information for Wetland Delineation Consultants

Horrocks Engineers
Ryan Pitts
2162 West Grove Parkway, Suite 400
Pleasant Grove, UT 84062
Ph. (801) 763-5184
ryanp@horrocks.com

Results

Ryan Pitts and Nicole Tolley of Horrocks Engineers conducted a field reconnaissance on July 18, 2013. The delineation study area of 62.9 acres was investigated to identify all wetlands and waters of the U.S. present. Potentially jurisdictional wetlands and waters of the U.S. were identified, documented, and mapped.

The delineation study area is comprised of multiple fields and a stockyard. It appears that all of the fields have been utilized as pastures and the fields in the western portion of the delineation study area (west of the existing structures) have been hayed in the past.

Wetlands

Wetland delineation maps are located in Appendix A. Table 1 below presents general information about the wetlands, with more detailed information below the table.

Table 1: Summary of Wetlands

Wetland ID	Size (acres)	Hydrogeomorphic Classification
Wetland 1	0.03	PEMA
Wetland 2	4.62	PEMA
Wetland 3	3.25	PEMA
Wetland 4	0.35	PEMA
Wetland 5	0.32	PEME
Wetland 6	1.81	PEMA
Wetland 7	0.26	PEMA
Wetland 8	0.70	PEMA
Wetland 9	1.50	PEMA
Wetland 10	0.77	PEMA
Wetland 11	0.59	PEMA
Wetland 12	0.43	PEMA
Wetland 13	0.29	PEME
Total	**14.92**	

West Fields

This area is west of the existing structures located in the delineation study area and includes Wetlands 1-3 and Wetlands 7-11. This area is relatively flat and has been grazed and hayed in the past. Most of the vegetation was very dry, but primarily dominated by facultative or wetter plants. If irrigation water remains off, it is likely that the vegetation will transition from wetland to upland species. The soils encountered were very dry and extremely difficult to dig. A nearly impenetrable barrier has been created by the clay near the soil surface. A restrictive clay barrier was present at nearly every sample point. Hydrology indicators were generally weak and limited to soil cracking in the lowest areas. No other hydrology indicators were present. See Figures in Appendix A, sample point data forms in Appendix B, and Appendix C for photographs. Additional information about the site can be located in the Preliminary Wetland Delineation located in Appendix D.

East Fields

This area is east of the existing structures located in the delineation study area and includes Wetlands 4-6 and Wetlands 12 and 13. This area does have noticeable elevation changes with obvious high and low areas. The area does appear to have served as pasture, but likely has never been hayed. A broader range of species was encountered and included everything from obligate to upland species. The soils were moist in the lowest areas, but very dry and difficult to dig in the uplands. Hydrology indicators were present in the areas designated as wetlands, but not in the uplands. See Figures in Appendix A, sample point data forms in Appendix B, and Appendix C for photographs. Additional information about the site can be located in the Preliminary Wetland Delineation located in Appendix D.

Waters of the U.S.

Five unnamed canals/ditches were identified and in use in the delineation study area at the time of the field visit. Waters of the U.S. 1 is the largest canal/ditch documented. It flows from the east to the west and bisects the study area. It appears to originate east of the study area in a natural slough and flows to the Little Bear River. The other canals/ditches documented serve to distribute water from Waters of the U.S. 1.

Table 2: Summary of Water Features

Water ID	Size (acres)	Linear Feet
Waters of the U.S. 1	1.08	2,720
Waters of the U.S. 2	0.17	700
Waters of the U.S. 3	0.009	180
Waters of the U.S. 4	0.05	525
Waters of the U.S. 5	0.34	640
Total	**1.65**	**4,765**

Conclusion

Approximately 14.92 acres of palustrine wetland (mash and wet meadow) were identified and delineated within the study area and approximately 1.65 acres (4,765 linear feet) of waters of the U.S. were also documented.

References

AccuWeather, Inc. 2013. Accessed July 31, 2013. Retrieved from http://www.accuweather.com/en/us/logan-ut/84321/july-weather/331213.

Munsell. 2000. Munsell Soil Color Charts. Gretamacbeth. New Windsor, New York.

National Oceanic and Atmospheric Administration (NOAA), National Climate Data Center. 2013. Palmer Hydrological Drought Index May 2012 to April 2013. Accessed July 31, 2013. Retrieved from http://www.ncdc.noaa.gov/oa/climate/research/prelim/drought/phdiimage.html.

U.S. Army Corps of Engineers (USACE). 1987. Corps of Engineers Wetland Delineation Manual (Online Edition). Technical Report Y-87-1. U.S. Army Engineers Waterways Experiment Station. Vicksburg, Mississippi.

U.S. Army Corps of Engineers (USACE). 2012. North American Digital Flora: National Wetland Plant List. Retrieved from http://rsgisias.crrel.usace.army.mil/apex/f?p=703:1:.

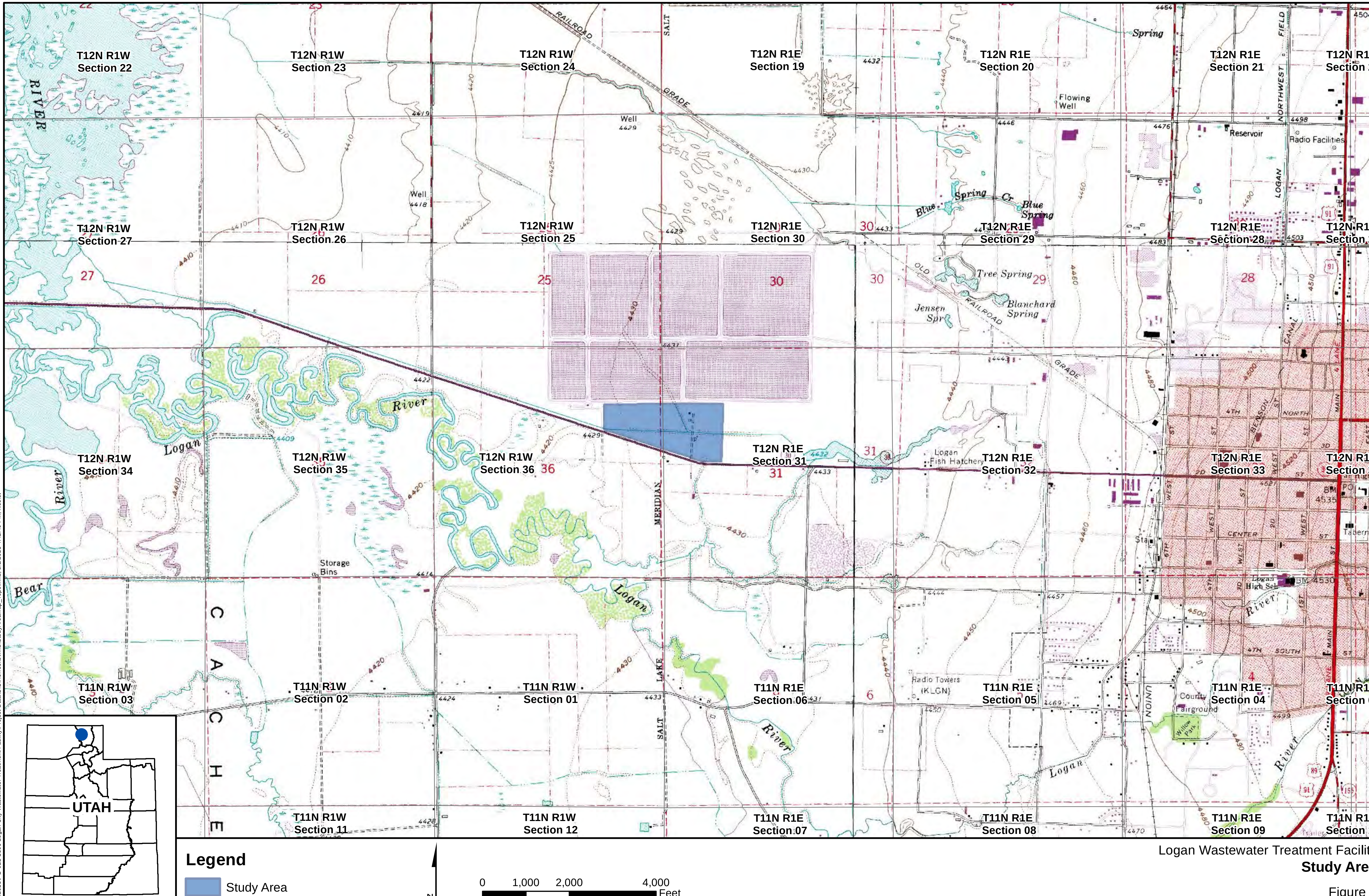
U.S. Army Corps of Engineers (USACE). 2008. Regional Supplement to the Corps of Engineers Delineation Manual: Arid West Region (Version 2.0). U.S. Army Corps of Engineer Research and Development Center. Vicksburg, Mississippi.

U.S. Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS). 2006. Field Indicators of Hydric Soils in the United States. Version 6.0.

Appendix A: Delineation Maps

Logan Wastewater Treatment Facility
Study Area

Figure 1



Logan Wastewater Treatment Facility
Study Area

Figure 2

O:\2013\PG-021-1306 Logan City Wastewater Treatment Facility\Project Data\GIS\Horrocks\Mxd\StudyAreaMap_Topo.mxd, 8/1/2013 4:42:49 PM, nicolet

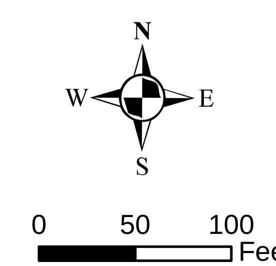
Logan City Wastewater Treatment Facility

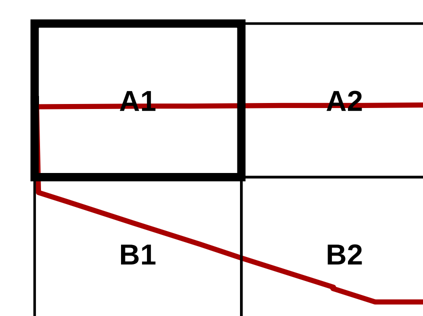
Wetland and Waters of the U.S. Delineation

Map A1

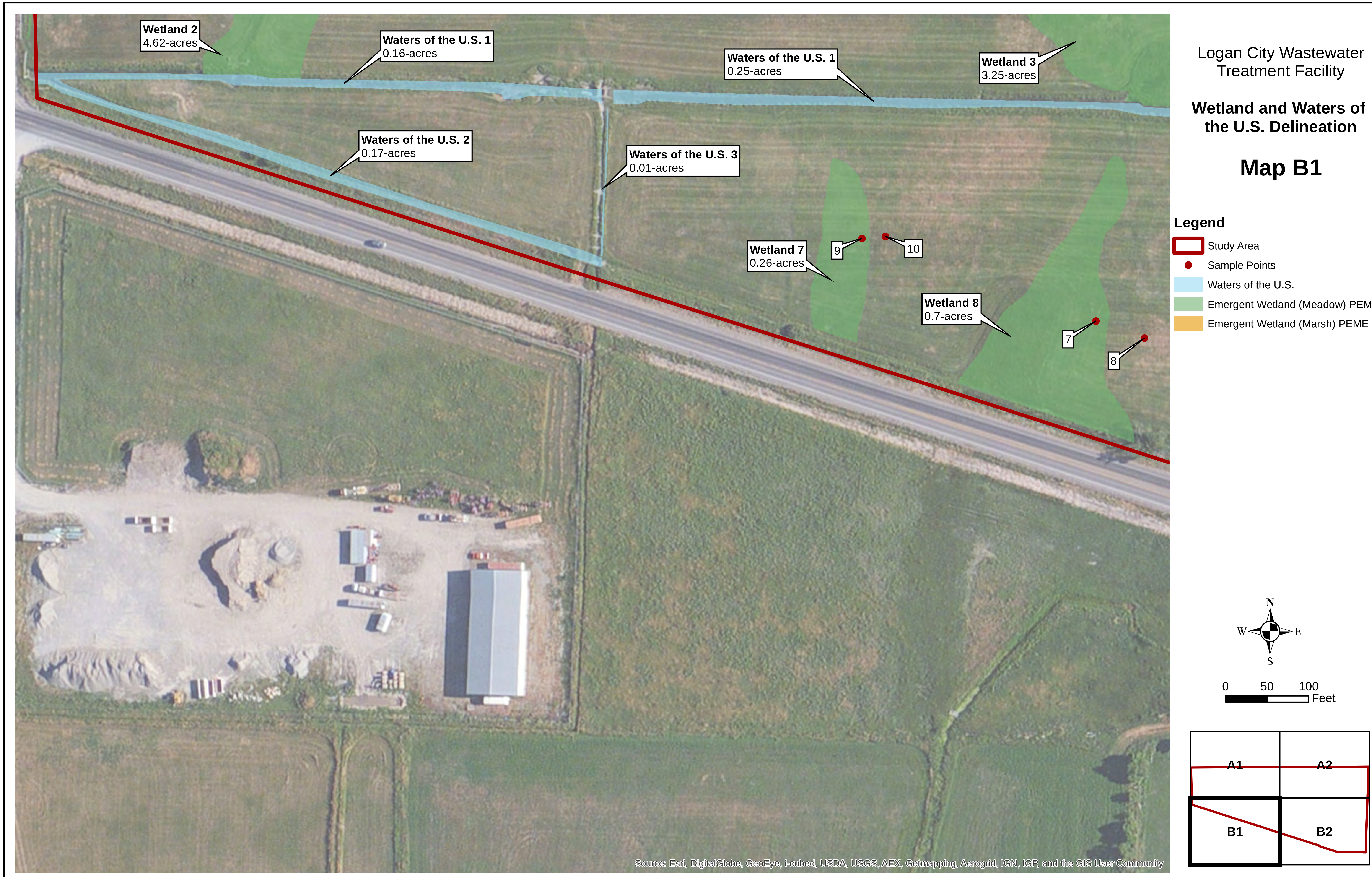
Legend

- Study Area
- Sample Points
- Waters of the U.S.
- Emergent Wetland (Meadow) PEMA
- Emergent Wetland (Marsh) PEME

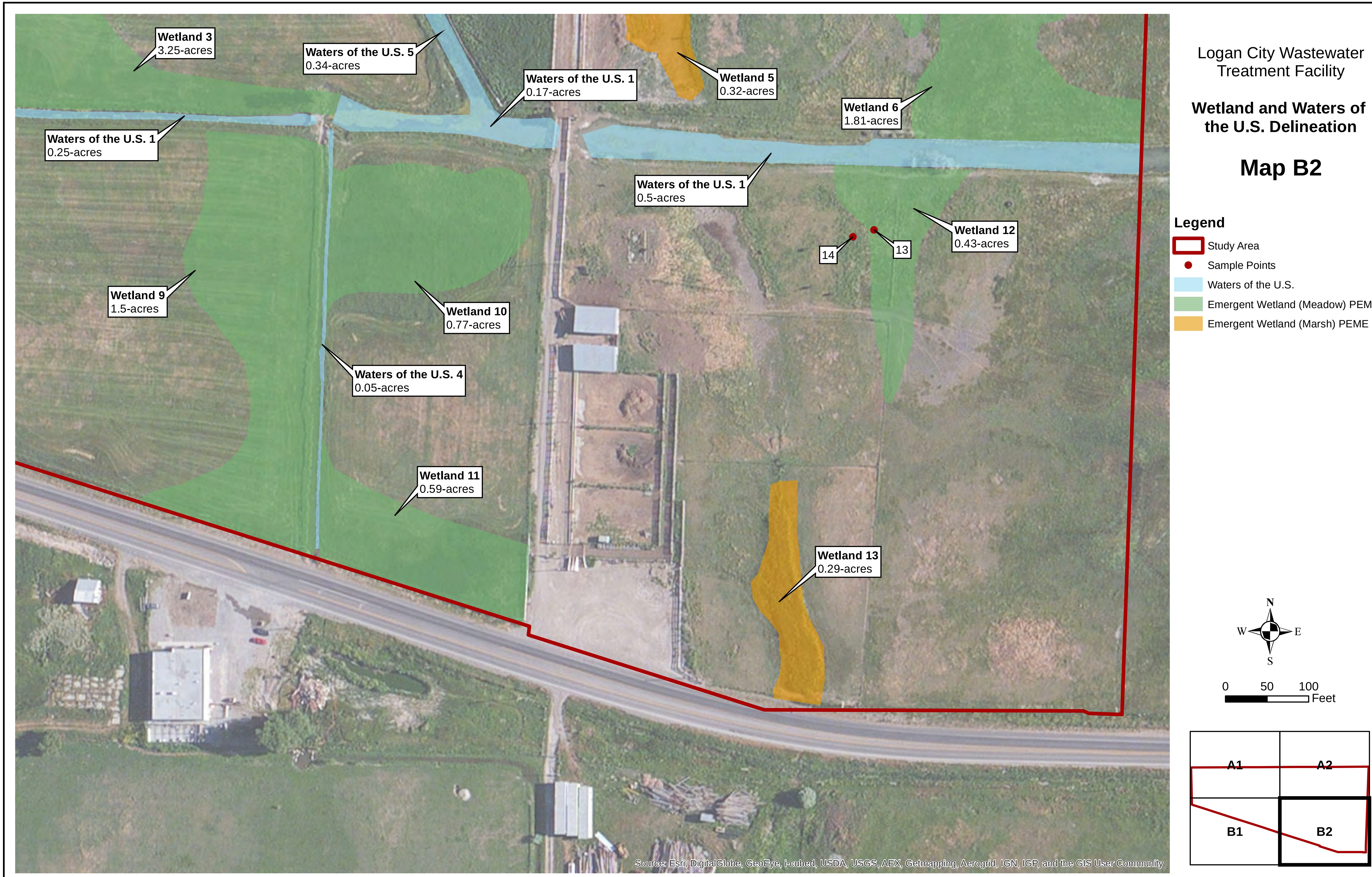





Logan City Wastewater Treatment Facility
Wetland and Waters of the U.S. Delineation
Map A2
Legend
Study Area
Sample Points
Waters of the U.S.
Emergent Wetland (Meadow) PEMA
Emergent Wetland (Marsh) PEME
Wetland 4
0.35-acres
Wetland 6
1.81-acres
Wetland 3
3.25-acres
Waters of the U.S. 5
0.34-acres
Wetland 5
0.32-acres
5
6
11
12
N
W
E
S
0
50
100
Feet
A1
A2
B1
B2
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community



Logan City Wastewater Treatment Facility
Wetland and Waters of the U.S. Delineation
Map B1
Legend
Study Area
Sample Points
Waters of the U.S.
Emergent Wetland (Meadow) PEMA
Emergent Wetland (Marsh) PEME
Wetland 2 4.62-acres
Waters of the U.S. 1 0.16-acres
Waters of the U.S. 1 0.25-acres
Wetland 3 3.25-acres
Waters of the U.S. 2 0.17-acres
Waters of the U.S. 3 0.01-acres
Wetland 7 0.26-acres
Wetland 8 0.7-acres
9
10
7
8
N
W
E
S
0 50 100 Feet
A1
A2
B1
B2
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community


Wetland 3
3.25-acres
Waters of the U.S. 5
0.34-acres
Waters of the U.S. 1
0.17-acres
Wetland 5
0.32-acres
Wetland 6
1.81-acres
Waters of the U.S. 1
0.25-acres
Waters of the U.S. 1
0.5-acres
Wetland 12
0.43-acres
14
13
Wetland 9
1.5-acres
Wetland 10
0.77-acres
Waters of the U.S. 4
0.05-acres
Wetland 11
0.59-acres
Wetland 13
0.29-acres
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
Logan City Wastewater Treatment Facility
Wetland and Waters of the U.S. Delineation
Map B2
Legend
Study Area
Sample Points
Waters of the U.S.
Emergent Wetland (Meadow) PEMA
Emergent Wetland (Marsh) PEME
N
W
E
S
0
50
100
Feet
A1
A2
B1
B2

Appendix B:
Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Logan City Wastewater Treatment Facility City/County: Logan/Cache Sampling Date: July 18, 2013

Applicant/Owner: Logan City State: UT Sampling Point: 1

Investigator(s): Ryan Pitts & Nicole Tolley Section, Township, Range: Section 36 of Township 12 North, Range 1 West

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): <1%

Subregion (LRR): D - Interior Deserts Lat: 41.7386461328 Long: -111.89580055 Datum: NAD 83

Soil Map Unit Name: Logan Silty Clay Loam (hydric) NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○
Hydric Soil Present?	Yes ◉	No ○
Wetland Hydrology Present?	Yes ◉	No ○

Is the Sampled Area within a Wetland? **Yes** ◉ **No** ○

Remarks: Irrigation water has been diverted from the site and the region is experiencing drought conditions.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex nebraskensis*	55	Yes	OBL
2. *Alopecurus pratensis*	30	Yes	FACW
3. *Hordeum jubatum*	10		FAC
4. *Scirpus pungens*	2.5		OBL
5. *Eleocharis palustris*	2.5		OBL
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	60	x 1 =	60
FACW species	30	x 2 =	60
FAC species	10	x 3 =	30
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	100 (A)		150 (B)

Prevalence Index = B/A = 1.50

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ◉ **No** ○

Remarks:

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-4	10 YR 3/1	100					Silty Clay Loam	30 % Fibric Root Mass
4-15	10 YR 5/1	100					Loamy Clay	
15-18	10 YR 5/2	100					Loamy Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5) (**LRR C**)
- [ ] 1 cm Muck (A9) (**LRR D**)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- [ ] 1 cm Muck (A9) (**LRR C**)
- [ ] 2 cm Muck (A10) (**LRR B**)
- [ ] Reduced Vertic (F18)
- [ ] Red Parent Material (TF2)
- [ ] Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type:
Depth (inches):

Hydric Soil Present? Yes (●) No ( )

Remarks: Logan Silty Clay Loam is Hydric. Hydric soils assumed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1) (**Nonriverine**)
- [ ] Sediment Deposits (B2) (**Nonriverine**)
- [ ] Drift Deposits (B3) (**Nonriverine**)
- [x] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Salt Crust (B11)
- [ ] Biotic Crust (B12)
- [ ] Aquatic Invertebrates (B13)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Plowed Soils (C6)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Marks (B1) (**Riverine**)
- [ ] Sediment Deposits (B2) (**Riverine**)
- [ ] Drift Deposits (B3) (**Riverine**)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Thin Muck Surface (C7)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Shallow Aquitard (D3)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ( )	No (●)	Depth (inches):
Water Table Present?	Yes ( )	No (●)	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ( )	No (●)	Depth (inches):

Wetland Hydrology Present? **Yes** (●) **No** ( )

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Some soil cracking in low lying ditch adjacent to sample point, but not abundant beyond ditch.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Logan City Wastewater Treatment Facility   City/County: Logan/Cache   Sampling Date: July 18, 2013

Applicant/Owner: Logan City   State: UT   Sampling Point: 2

Investigator(s): Ryan Pitts & Nicole Tolley   Section, Township, Range: Section 36 of Township 12 North, Range 1 West

Landform (hillslope, terrace, etc.): terrace   Local relief (concave, convex, none): none   Slope (%): <1%

Subregion (LRR): D - Interior Deserts   Lat: 41.7387273261999   Long: -111.895894923   Datum: NAD 83

Soil Map Unit Name: Collett Silty Clay Loam (not hydric)   NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ○	No ◉	
Hydric Soil Present?	Yes ○	No ◉	Is the Sampled Area
Wetland Hydrology Present?	Yes ○	No ◉	within a Wetland? Yes ○ No ◉

Remarks: Irrigation water has been diverted from the site and the region is experiencing drought conditions.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Festuca pratensis*	70	Yes	FACU
2. *Hordeum jubatum*	20	Yes	FAC
3. *Carex nebraskensis*	10		OBL
4.			
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 %   % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species		x 2 =	0
FAC species	20	x 3 =	60
FACU species	70	x 4 =	280
UPL species		x 5 =	0
Column Totals:	100 (A)		350 (B)

Prevalence Index = B/A = 3.50

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-6	10 YR 3/1	100					Silty Clay Loam	
6-16	10 YR 4/2	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay

Depth (inches): 6

Hydric Soil Present? Yes ○ No ●

Remarks: Very difficult to dig through clay.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ● Depth (inches):

Water Table Present? Yes ○ No ● Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ● Depth (inches):

Wetland Hydrology Present? Yes ○ No ●

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Logan City Wastewater Treatment Facility   City/County: Logan/Cache   Sampling Date: July 18, 2013

Applicant/Owner: Logan City   State: UT   Sampling Point: 3

Investigator(s): Ryan Pitts & Nicole Tolley   Section, Township, Range: Section 36 of Township 12 North, Range 1 West

Landform (hillslope, terrace, etc.): terrace   Local relief (concave, convex, none): none   Slope (%): <1%

Subregion (LRR): D - Interior Deserts   Lat: 41.7393375356   Long: -111.894206847   Datum: NAD 83

Soil Map Unit Name: Collet Silty Clay Loam (not hydric)   NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○
Hydric Soil Present?	Yes ◉	No ○
Wetland Hydrology Present?	Yes ◉	No ○

Is the Sampled Area within a Wetland? **Yes** ◉ **No** ○

Remarks: Irrigation water has been diverted from the site and the region is experiencing drought conditions.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex nebraskensis*	100	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 %   % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x 1 =	100
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	100 (A)		100 (B)

Prevalence Index = B/A = 1.00

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ◉ **No** ○

Remarks:

SOIL

Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-6	10 YR 2/2						Clay	50% Fibric Root Mass
6-10	10 YR 4/2						Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay

Depth (inches): 10

Hydric Soil Present? **Yes** ◉ **No** ○

Remarks: Unable to dig past 10 inches - solid clay. Hydric soils assumed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☒ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? **Yes** ◉ **No** ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Weak soil surface cracking.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Logan City Wastewater Treatment Facility City/County: Logan/Cache Sampling Date: July 18, 2013

Applicant/Owner: Logan City State: UT Sampling Point: 4

Investigator(s): Ryan Pitts & Nicole Tolley Section, Township, Range: Section 36 of Township 12 North, Range 1 West

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): <1%

Subregion (LRR): D - Interior Deserts Lat: 41.73927816 Long: -111.8941214 Datum: NAD 83

Soil Map Unit Name: Collet Silty Clay Loam (not hydric) NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○
Hydric Soil Present?	Yes ○	No ◉
Wetland Hydrology Present?	Yes ○	No ◉

Is the Sampled Area within a Wetland? Yes ○ No ◉

Remarks: Irrigation water has been diverted from the site and the region is experiencing drought conditions.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Distichlis spicata*	60	Yes	FAC
2. *Hordeum jubatum*	20	Yes	FAC
3. *Phalaris arundinacea*	15		FACW
4. *Phleum pratense*	5		FACU
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	15	x 2 =	30
FAC species	80	x 3 =	240
FACU species	5	x 4 =	20
UPL species		x 5 =	0
Column Totals:	100 (A)		290 (B)

Prevalence Index = B/A = 2.90

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-3	10 YR 4/1	100					Loamy Clay	50% Fibric Root Mass
3-8	10 YR 4/1	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay

Depth (inches): 8

Hydric Soil Present? Yes ○ No ◉

Remarks: Unable to dig past 8 inches - solid clay.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Logan City Wastewater Treatment Facility City/County: Logan/Cache Sampling Date: July 18, 2013

Applicant/Owner: Logan City State: UT Sampling Point: 5

Investigator(s): Ryan Pitts & Nicole Tolley Section, Township, Range: Section 31 of Township 12 North, Range 1 East

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): <1%

Subregion (LRR): D - Interior Deserts Lat: 41.73875483 Long: -111.8917198 Datum: NAD 83

Soil Map Unit Name: Logan Silty Clay Loam (hydric) NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○
Hydric Soil Present?	Yes ◉	No ○
Wetland Hydrology Present?	Yes ◉	No ○

Is the Sampled Area within a Wetland? Yes ◉ No ○

Remarks: Irrigation water has been diverted from the site and the region is experiencing drought conditions.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex nebraskensis*	100	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x 1 =	100
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	100 (A)		100 (B)

Prevalence Index = B/A = 1.00

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-4	10 YR 3/1	100					Clay	50% Fibric Root Mass
4-12	10 YR 3/1	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay

Depth (inches): 12

Hydric Soil Present? Yes ◉ **No** ○

Remarks: Unable to dig past 12 inches - solid clay. Hydric soils assumed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☒ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ◉ **No** ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Some soil cracking in low lying ditch adjacent to sample point, but abundant beyond ditch.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Logan City Wastewater Treatment Facility　City/County: Logan/Cache　Sampling Date: July 18, 2013

Applicant/Owner: Logan City　State: UT　Sampling Point: 6

Investigator(s): Ryan Pitts & Nicole Tolley　Section, Township, Range: Section 31 of Township 12 North, Range 1 East

Landform (hillslope, terrace, etc.): terrace　Local relief (concave, convex, none): convex　Slope (%): <1%

Subregion (LRR): D - Interior Deserts　Lat: 41.73875107　Long: -111.8915642　Datum: NAD 83

Soil Map Unit Name: Logan Silty Clay Loam (hydric)　NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed?　Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic?　(If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○
Hydric Soil Present?	Yes ○	No ◉
Wetland Hydrology Present?	Yes ○	No ◉

Is the Sampled Area within a Wetland? Yes ○ **No** ◉

Remarks: Irrigation water has been diverted from the site and the region is experiencing drought conditions.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Distichlis spicata*	50	Yes	FAC
2. *Atriplex argentea*	10		FAC
3. *Grindelia squarrosa*	10		UPL
4. *Sporobolis airoides*	10		FAC
5. *Agropyron trachycaulum*	5		UPL
6. *Cirsium arvense*	5		FACU
7.			
8.			
Total Cover:	90 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 10 %　% Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	70	x 3 =	210
FACU species	5	x 4 =	20
UPL species	15	x 5 =	75
Column Totals:	90 (A)		305 (B)

Prevalence Index = B/A = 3.39

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ◉ **No** ○

Remarks:

SOIL

Sampling Point: 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-12	10 YR 3/1	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay

Depth (inches): 12

Hydric Soil Present? Yes ○ No ●

Remarks: Unable to dig past 12 inches - solid clay.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ●	Depth (inches):
Water Table Present?	Yes ○	No ●	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ●	Depth (inches):

Wetland Hydrology Present? Yes ○ No ●

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Logan City Wastewater Treatment Facility City/County: Logan/Cache Sampling Date: July 18, 2013

Applicant/Owner: Logan City State: UT Sampling Point: 7

Investigator(s): Ryan Pitts & Nicole Tolley Section, Township, Range: Section 36 of Township 12 North, Range 1 West

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR): D - Interior Deserts Lat: 41.73742968 Long: -111.8922437 Datum: NAD 83

Soil Map Unit Name: Greenson Loam, Deep Over Clay, 0 to 1% Slopes (hydric) NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ◯ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ◯

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ◯
Hydric Soil Present?	Yes ◉	No ◯
Wetland Hydrology Present?	Yes ◉	No ◯

Is the Sampled Area within a Wetland? **Yes** ◉ **No** ◯

Remarks: Irrigation water has been diverted from the site and the region is experiencing drought conditions.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex nebraskensis*	40	Yes	OBL
2. *Triglochin maritima*	25	Yes	OBL
3. *Hordeum jubatum*	15		FAC
4. *Phalaris arundinacea*	5		FACW
5. *Rumex crispus*	5		FAC
6.			
7.			
8.			
Total Cover:	90 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 10 % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	65	x 1 =	65
FACW species	5	x 2 =	10
FAC species	20	x 3 =	60
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	90 (A)		135 (B)

Prevalence Index = B/A = 1.50

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ◉ **No** ◯

Remarks:

SOIL

Sampling Point: 7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-3	10 YR 3/1	100					Clay	50% Fibric Root Mass
3-10	10 YR 3/1	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay

Depth (inches): 10

Hydric Soil Present? **Yes** ◉ **No** ○

Remarks: Unable to dig past 10 inches - solid clay. Hydric soils assumed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☒ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? **Yes** ◉ **No** ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Weak soil surface cracking.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Logan City Wastewater Treatment Facility City/County: Logan/Cache Sampling Date: July 18, 2013

Applicant/Owner: Logan City State: UT Sampling Point: 8

Investigator(s): Ryan Pitts & Nicole Tolley Section, Township, Range: Section 36 of Township 12 North, Range 1 West

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Convex Slope (%): <1%

Subregion (LRR): D - Interior Deserts Lat: 41.73737409 Long: -111.8920298 Datum: NAD 83

Soil Map Unit Name: Greenson Loam, Deep Over Clay, 0 to 1% Slopes (hydric) NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○
Hydric Soil Present?	Yes ○	No ◉
Wetland Hydrology Present?	Yes ○	No ◉

Is the Sampled Area within a Wetland? Yes ○ No ◉

Remarks: Irrigation water has been diverted from the site and the region is experiencing drought conditions.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Distichlis spicata*	40	Yes	FAC
2. *Poa pratensis*	20	Yes	FAC
3. *Festuca pratensis*	10		FACU
4. *Carex praegracilis*	10		FACW
5.			
6.			
7.			
8.			
Total Cover:	80 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 20 % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	10	x 2 =	20
FAC species	60	x 3 =	180
FACU species	10	x 4 =	40
UPL species		x 5 =	0
Column Totals:	80 (A)		240 (B)

Prevalence Index = B/A = 3.00

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: 8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-10	10 YR 3/1	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay

Depth (inches): 10

Hydric Soil Present? Yes ○ No ◉

Remarks: Unable to dig past 10 inches - solid clay.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Logan City Wastewater Treatment Facility City/County: Logan/Cache Sampling Date: July 18, 2013

Applicant/Owner: Logan City State: UT Sampling Point: 9

Investigator(s): Ryan Pitts & Nicole Tolley Section, Township, Range: Section 36 of Township 12 North, Range 1 West

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR): D - Interior Deserts Lat: 41.73769832 Long: -111.8932752 Datum: NAD 83

Soil Map Unit Name: Greenson Loam, Deep Over Clay, 0 to 1% Slopes (hydric) NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	◉	○
Hydric Soil Present?	◉	○
Wetland Hydrology Present?	◉	○

Is the Sampled Area within a Wetland? Yes ◉ No ○

Remarks: Irrigation water has been diverted from the site and the region is experiencing drought conditions.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex nebraskensis*	30	Yes	OBL
2. *Triglochin maritima*	20	Yes	OBL
3. *Scirpus acutus*	20	Yes	OBL
4. *Hordeum jubatum*	10		FAC
5. *Rumex crispus*	10		FAC
6. *Sporobolis airoides*	5		FAC
7. *Alopecurus pratensis*	5		FACW
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	70	x 1 =	70
FACW species	5	x 2 =	10
FAC species	25	x 3 =	75
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	100 (A)		155 (B)

Prevalence Index = B/A = 1.55

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: 9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-4	10 YR 3/1						Clay	50% Fibric Root Mass
4-10	10 Y/R 3/1						Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay

Depth (inches): 10

Hydric Soil Present? **Yes** ◉ **No** ○

Remarks: Unable to dig past 10 inches - solid clay. Hydric soils assumed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☒ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? **Yes** ◉ **No** ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Weak soil surface cracking.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Logan City Wastewater Treatment Facility | City/County: Logan/Cache | Sampling Date: July 18, 2013

Applicant/Owner: Logan City | State: UT | Sampling Point: 10

Investigator(s): Ryan Pitts & Nicole Tolley | Section, Township, Range: Section 36 of Township 12 North, Range 1 West

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): | Slope (%): <1%

Subregion (LRR): D - Interior Deserts | Lat: 41.73770524 | Long: -111.8931723 | Datum: NAD 83

Soil Map Unit Name: Greenson Loam, Deep Over Clay, 0 to 1% Slopes (hydric) | NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	◉	○
Hydric Soil Present?	○	◉
Wetland Hydrology Present?	○	◉

Is the Sampled Area within a Wetland? Yes ○ No ◉

Remarks: Irrigation water has been diverted from the site and the region is experiencing drought conditions.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Festuca pratensis*	30	Yes	FACU
2. *Distichlis spicata*	20	Yes	FAC
3. *Sporobolis airoides*	20	Yes	FAC
4. *Hordeum jubatum*	10	No	FAC
5. *Trifolium pratense*	10	No	FACU
6.			
7.			
8.			
Total Cover:	90 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 10 % | % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	50	x 3 =	150
FACU species	40	x 4 =	160
UPL species		x 5 =	0
Column Totals:	90	(A)	310 (B)

Prevalence Index = B/A = 3.44

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: 10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-6	10 YR 3/1	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay

Depth (inches): 6

Hydric Soil Present? Yes ○ No ◉

Remarks: Unable to dig past 6 inches - solid clay.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Logan City Wastewater Treatment Facility | City/County: Logan/Cache | Sampling Date: July 18, 2013

Applicant/Owner: Logan City | State: UT | Sampling Point: 11

Investigator(s): Ryan Pitts & Nicole Tolley | Section, Township, Range: Section 31 of Township 12 North, Range 1 East

Landform (hillslope, terrace, etc.): drainage | Local relief (concave, convex, none): Concave | Slope (%): <1%

Subregion (LRR): D - Interior Deserts | Lat: 41.73869714 | Long: -111.8890105 | Datum: NAD 83

Soil Map Unit Name: Airport - Salt Lake Complex (hydric) | NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ● (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ● No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ●	No ○
Hydric Soil Present?	Yes ●	No ○
Wetland Hydrology Present?	Yes ●	No ○

Is the Sampled Area within a Wetland? Yes ● No ○

Remarks: This site does not appear to have been irrigated in the past. Terrain is "hilly", not flat. Sample point located in possible remnant oxbow or drainage channel/swell.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Scirpus acutus*	40	Yes	OBL
2. *Typha latifolia*	40	Yes	OBL
3. *Carex nebraskensis*	10	No	OBL
4. *Polypogon monspeliensis*	10	No	FACW
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	90	x 1 =	90
FACW species	10	x 2 =	20
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	100 (A)		110 (B)

Prevalence Index = B/A = 1.10

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ● No ○

Remarks:

SOIL

Sampling Point: 11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-6	10 YR 3/1	100					Silty Clay Loam	Moist
6-20	10 YR 4/1	100					Silty Clay	Saturated at 16 inches

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☒ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ◉ **No** ○

Remarks: Full profile sampled assumed to fit the definition of mucky - very greasy.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☒ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☒ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ◉	No ○	Depth (inches): 16

Wetland Hydrology Present? Yes ◉ **No** ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Evidence of inundation earlier in the year.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Logan City Wastewater Treatment Facility
City/County: Logan/Cache
Sampling Date: July 18, 2013
Applicant/Owner: Logan City
State: UT
Sampling Point: 12
Investigator(s): Ryan Pitts & Nicole Tolley
Section, Township, Range: Section 31 of Township 12 North, Range 1 East
Landform (hillslope, terrace, etc.): Crown of hillslope.
Local relief (concave, convex, none): Convex
Slope (%): <1%
Subregion (LRR): D - Interior Deserts
Lat: 41.73869363
Long: -111.8889345
Datum: NAD 83
Soil Map Unit Name: Airport - Salt Lake Complex (hydric)
NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ● (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ● No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	●	○
Hydric Soil Present?	○	●
Wetland Hydrology Present?	○	●

Is the Sampled Area within a Wetland? Yes ○ No ●

Remarks: This site does not appear to have been irrigated in the past. Terrain is "hilly", not flat.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Distichlis spicata*	40	Yes	FAC
2. *Ambrosia artemisiifilia*	15	No	FACU
3. *Melilotus alba*	15	No	UPL
4. *Hordeum jubatum*	10	No	FAC
5. *Xanthium strumarium*	10	No	FAC
6.			
7.			
8.			
Total Cover:	90 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 10 % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	60	x 3 =	180
FACU species	15	x 4 =	60
UPL species	15	x 5 =	75
Column Totals:	90 (A)		315 (B)

Prevalence Index = B/A = 3.50

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ● No ○

Remarks:

SOIL

Sampling Point: 12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-6	10 YR 3/2	100					Loamy Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay

Depth (inches): 6

Hydric Soil Present? Yes ○ No ◉

Remarks: Unable to dig past 6 inches - solid clay.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Logan City Wastewater Treatment Facility — City/County: Logan/Cache — Sampling Date: July 18, 2013

Applicant/Owner: Logan City — State: UT — Sampling Point: 13

Investigator(s): Ryan Pitts & Nicole Tolley — Section, Township, Range: Section 31 of Township 12 North, Range 1 East

Landform (hillslope, terrace, etc.): terrace — Local relief (concave, convex, none): Concave — Slope (%): <1%

Subregion (LRR): D - Interior Deserts — Lat: 41.73774373 — Long: -111.8881407 — Datum: NAD 83

Soil Map Unit Name: Airport - Salt Lake Complex (hydric) — NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ● (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ● No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ●	No ○
Hydric Soil Present?	Yes ●	No ○
Wetland Hydrology Present?	Yes ●	No ○

Is the Sampled Area within a Wetland? Yes ● No ○

Remarks: Irrigation water has been diverted from the site and the region is experiencing drought conditions.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Carex praegracilis*	30	Yes	FACW
2. *Hordeum jubatum*	20	Yes	FAC
3. *Juncus arcticus*	20	Yes	FACW
4. *Scirpus pungens*	20	Yes	OBL
5. *Distichlis spicata*	10	No	FAC
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 % — % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	50	x 2 =	100
FAC species	30	x 3 =	90
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	100 (A)		210 (B)

Prevalence Index = B/A = 2.10

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ● No ○

Remarks:

SOIL

Sampling Point: 13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-4	10 YR 2/2						Clay Loam	25% Fibric Root Mass
4-18	10 YR 3/1						Clay Loam	Moist

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☒ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** ◉ **No** ○

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☒ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☒ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ◉ **No** ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Surface soil cracks present. Area appears to have been inundated earlier in the year. Noticeable hydrogen sulfide odor.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Logan City Wastewater Treatment Facility | City/County: Logan/Cache | Sampling Date: July 18, 2013

Applicant/Owner: Logan City | State: UT | Sampling Point: 14

Investigator(s): Ryan Pitts & Nicole Tolley | Section, Township, Range: Section 31 of Township 12 North, Range 1 East

Landform (hillslope, terrace, etc.): hillslope | Local relief (concave, convex, none): Convex | Slope (%): 2%

Subregion (LRR): D - Interior Deserts | Lat: 41.73772118 | Long: -111.8882342 | Datum: NAD 83

Soil Map Unit Name: Greenson Loam, Deep Over Clay, 0 to 1% Slopes (hydric) | NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ● (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ● No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	○	●
Hydric Soil Present?	○	●
Wetland Hydrology Present?	○	●

Is the Sampled Area within a Wetland? Yes ○ No ●

Remarks: Irrigation water has been diverted from the site and the region is experiencing drought conditions.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Agropyron repens*	35	Yes	UPL
2. *Distichlis spicata*	35	Yes	FAC
3. *Melilotus alba*	10	No	FACU
4. *Xanthium strumarium*	10	No	FAC
5. *Hordeum jubatum*	5	No	FAC
6. *Cirsium arvense*	5	No	FACU
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % | % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	50	x 3 =	150
FACU species	15	x 4 =	60
UPL species	35	x 5 =	175
Column Totals:	100 (A)		385 (B)

Prevalence Index = B/A = 3.85

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ●

Remarks:

SOIL

Sampling Point: 14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-10	10 YR 2/1	100					Clay Loam	25% Fibric Root Mass

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
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- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Clay

Depth (inches): 10

Hydric Soil Present? Yes ○ No ◉

Remarks: Unable to dig past 10 inches - solid clay.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix C: Photos

Sample Point 1

Sample Point 2

Sample Point 3

Sample Point 4

Sample Point 5

Sample Point 6

Sample Point 7

Sample Point 8

Sample Point 9

Sample Point 10

Sample Point 11

Sample Point 12

Sample Point 13

Sample Point 14

Site Photographs

Canal and Ditch - West Edge of Study Area - Looking East

Canal - Center of Study Area - Looking West

Site Photographs


Canal - Center of Study Area - Looking East


Ditch - Center of Study Area - Looking Southeast

Site Photographs

Ditch - West Side of Study Area - Looking South

Appendix D:
Preliminary Wetland Delineation

PRELIMINARY
WETLAND DELINEATION
LOGAN WASTEWATER EXPANSION AREA
CACHE COUNTY, UTAH

Prepared for:

Logan City Environmental Department
450 N 1000 W
Logan, UT 84321

Prepared by:

WHITE HORSE ASSOCIATES
SMITHFIELD, UTAH
ShermJensen@sisna.com
WhiteHorseAssociates.com

November 9, 2012

PROPERTY DEVELOPER:

J. Clinton Rogers/Tyler B. Bird
Carollo Engineers, Inc.
1265 E Fort Union Blvd, Suite 200
Midvale, UT 84047
(801) 233-2525
(801) 455-2168
TBird@carollo.com

PROPERTY OWNER:

Logan City
Contact: Issa A Hamud, PE/City of Logan Environmental Director
435-716-9752
Issa.Hamud@loganutah.org

WETLAND SCIENTIST:

Sherman Jensen/White Horse Associates, Inc.
Box 123
Smithfield, UT 84335
435-563-0123
ShermJensen@sisna.com

DIRECTIONS TO PROPERTY

…From Main Street in Logan, Utah

- Turn west on 200 North
- Go about 2.8 miles
- Property is on the north side of Valley View Highway (200 North) and immediately south of Logan Sewage Ponds

EXECUTIVE SUMMARY

A routine wetland delineation was conducted for 62.9 acres immediately south of the Logan sewage lagoons in Cache County, Utah following guidelines in the Wetlands Delineation Manual (1987) and the Arid West Supplement (2008). Five major vegetation types and miscellaneous features were identified:

Water: Irrigation canals and ditches for which the jurisdictional status was not considered.

Irrigated marsh: hydrophytic vegetation was present; hydric soil was present; surface water, water table, and saturation were perched on an impermeable clay layer; water features are a response to irrigation, <u>not</u> wetland hydrology. These areas are irrigated wetland.

Irrigated wet meadow: hydrophytic vegetation was present; hydric soil was present in some sites, but not in others; surface water, water table, and saturation were perched on impermeable clay layer; water features are a response to irrigation, <u>not</u> wetland hydrology. These areas are irrigated wetland.

Mesic/alkali meadow: hydrophytic vegetation was present in some areas, but not in others; hydric soil was not present; water table and saturation were typically present at a depth below 18 inches and were perched on an impermeable clay layer. Water features are a response to irrigation, <u>not</u> wetland hydrology. These areas may include irrigated wetland.

Miscellaneous features: These include buildings, corals, hay stack, irrigation structures, and road that are not wetland.

Field studies clearly indicate that hydrophytic vegetation present throughout the property is sustained by surface irrigation. Evidence includes:

- Soils below 2-3 feet get drier with depth, indicating that saturation/groundwater is perched and derived from surface water. Direct precipitation and irrigation are the only sources of surface water to the property. Precipitation has been well below evapotranspiration (ET).
- Wetland vegetation has disappeared in areas where irrigation has been inadvertently eliminated.
- Hydric soil indicators are not evident except in the wettest locations (*irrigated marsh*) where a layer of surface muck has accumulated over the 50 $\pm$ years of flood irrigation.
- The previous property owner and manager say that productive vegetation died during years when irrigation was in short supply.

Areas exhibiting wetland characteristics sustained solely by application of irrigation water are not regulated under Section 404 of the Clean Water Act. Jurisdictional wetland is not present in the property.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

AGRC = Automated Geographic Reference Center
FAC = Facultative
FACW = Facultative wetland
FACU = Facultative upland
HRO = High resolution orthophoto
NAIP = National Agricultural Imagery Program
NRCS = Natural Resource Conservation Service
NWI = National Wetland Inventory
OBL = Obligate
UPL = Upland
USACE = United States Army Corps of Engineers
WHA = White Horse Associates, Inc.

1.0 INTRODUCTION

Wetland was delineated for a 62.9 acre property located immediately south of the Logan Wastewater facility on 200 North in Logan, Utah. The property is in the south half of the northwest quarter of Section 31, Township 12N, Range 1E and part of the southeast quarter of the northeast quarter Section 36, Township 12N, Range 1W (Figure 1-1).

2.0 PROJECT AREA

The property occurs on low lake terrace at 4,430 feet elevation. Slope is less than 1 percent with west aspect. A canal arising from a slough east of the property drains west through the property towards the Little Bear River impounded by Cutler Dam (Figure 2-1). The ownership plat acquired from the Utah AGRC (Figure 2-2) show the property consists of five parcels. The property (Figure 2-3) is within the Little Bear-Logan Eighth Code HUC (16010203), the Logan River Tenth Code HUC (1601020303), and the Little Logan River-Logan River Twelve Code HUC (160102030308).

Several images are available for the property:

- 2003 NAIP Orthophoto (Figure 2-4A); 2 meter resolution.
- 2006 NAIP Orthophoto (Figure 2-4B); 1 meter resolution.
- 2006 HRO Orthophoto (Figure 2-4C); 1 foot resolution.
- 2009 NAIP Orthophoto (Figure 2-4D); 1 meter resolution
- 2009 HRO Orthophoto (Figure 2.4E); 1 foot resolution.
- 2011 NAIP Orthophoto (Figure 2.4F); 1 meter resolution.

The 2009 HRO image was selected as the base for mapping.

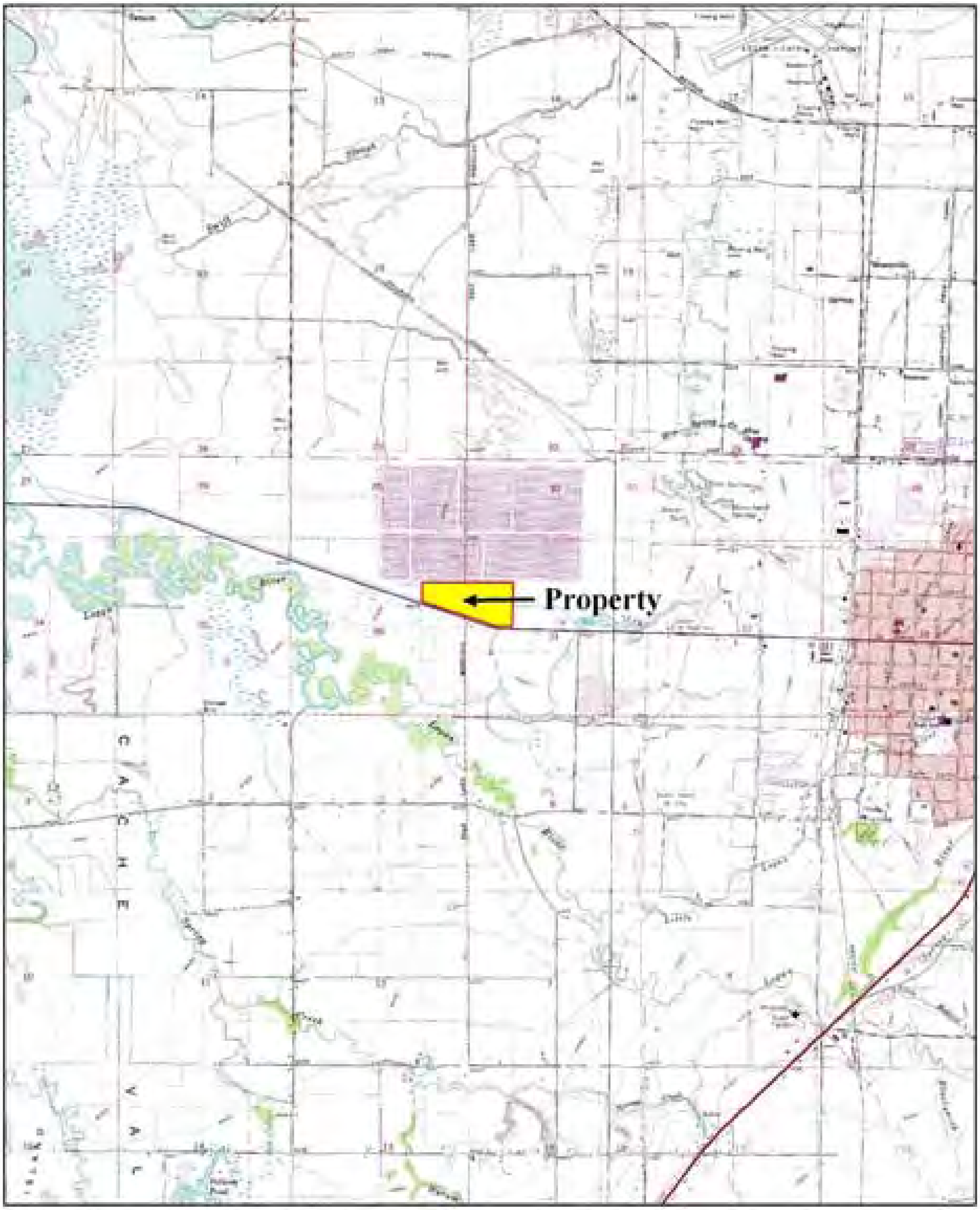


Figure 1-1

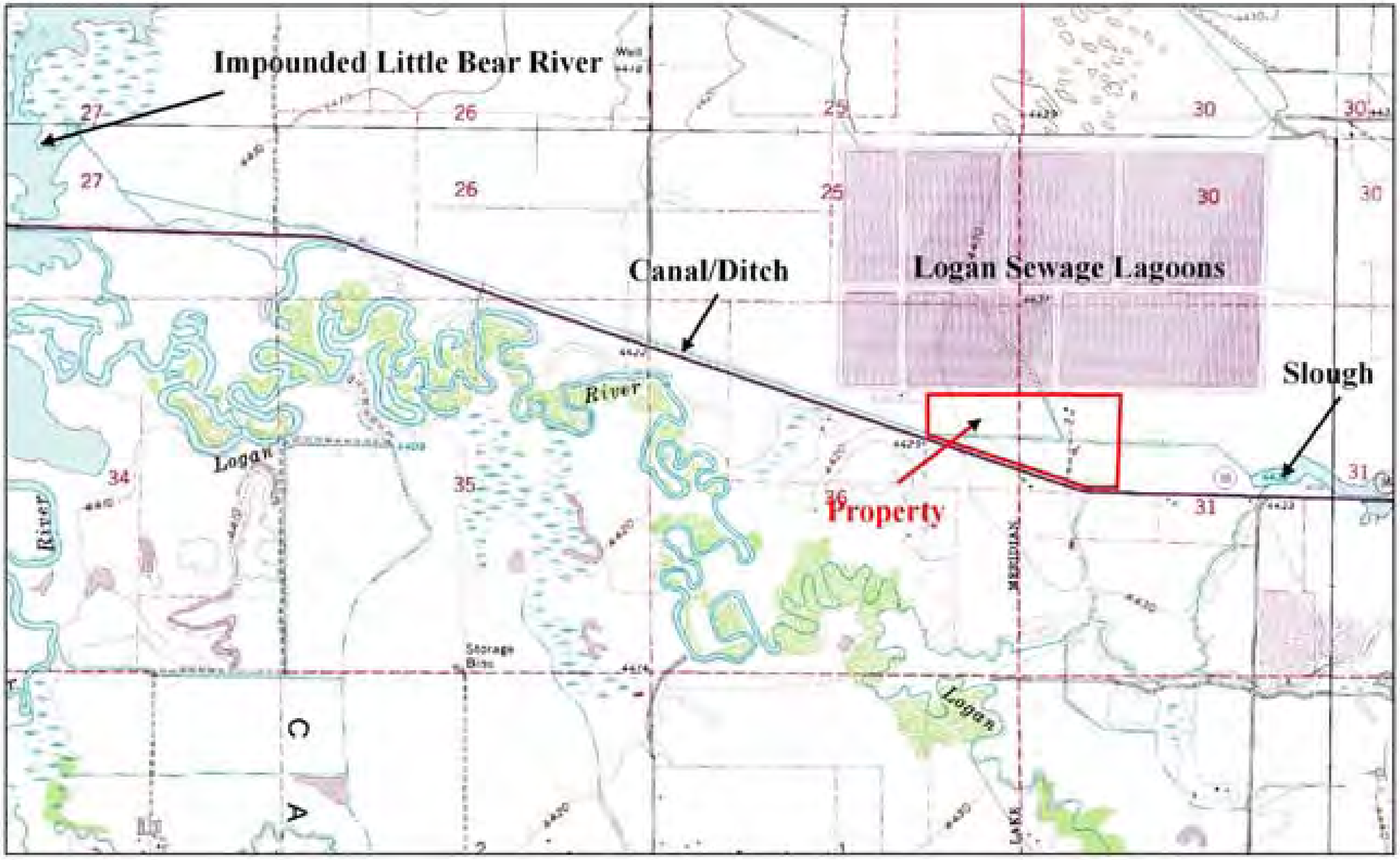
Logan Wastewater Facility Property

Note: Background is 1:24,000 scale USGS Digital Line Graphs (DLGs).

N

0 1.6

Miles



Hydric Features
Logan Wastewater Facility Property

Figure 2-1

Note: Features are 1:24,000 scale USGS DLGs.

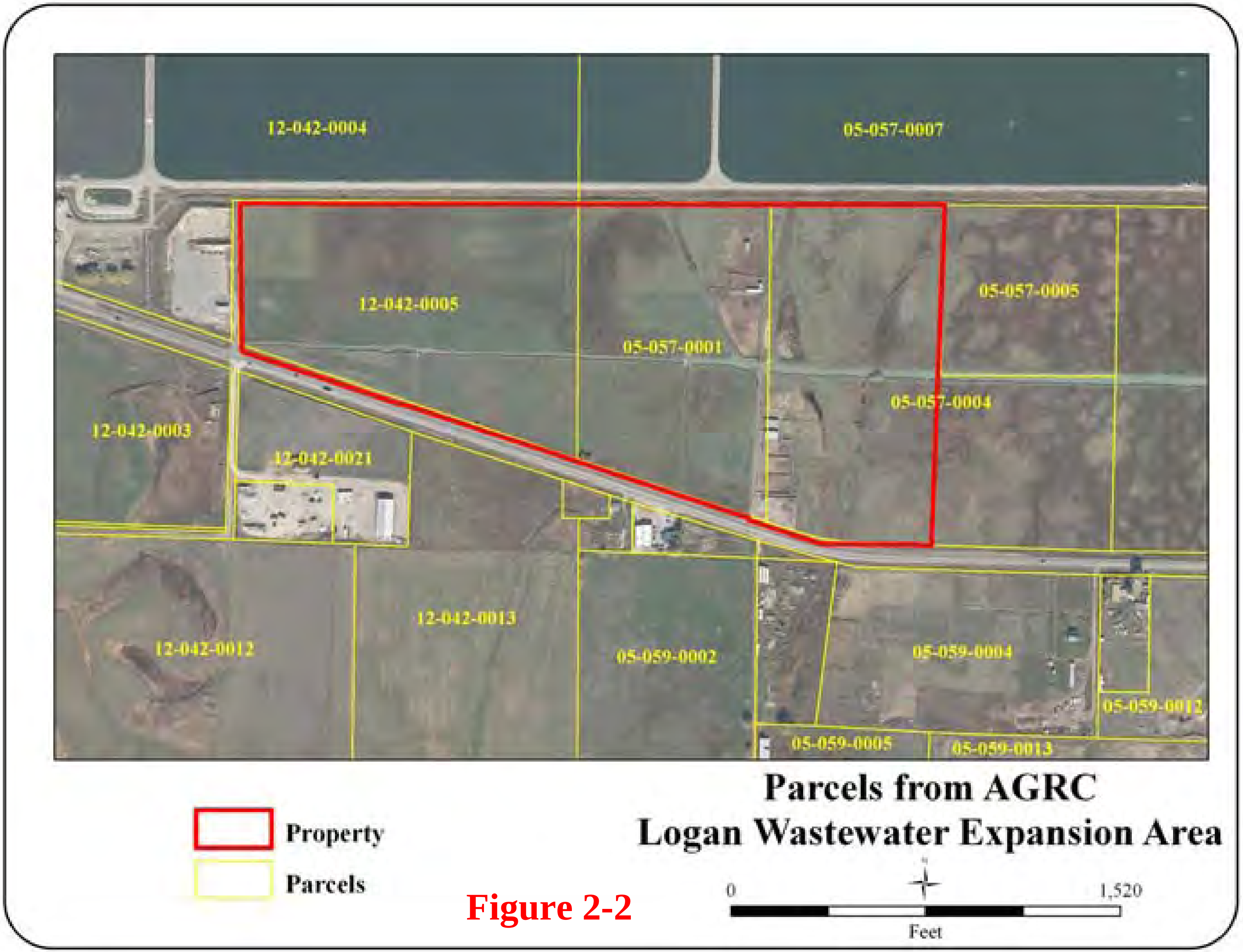
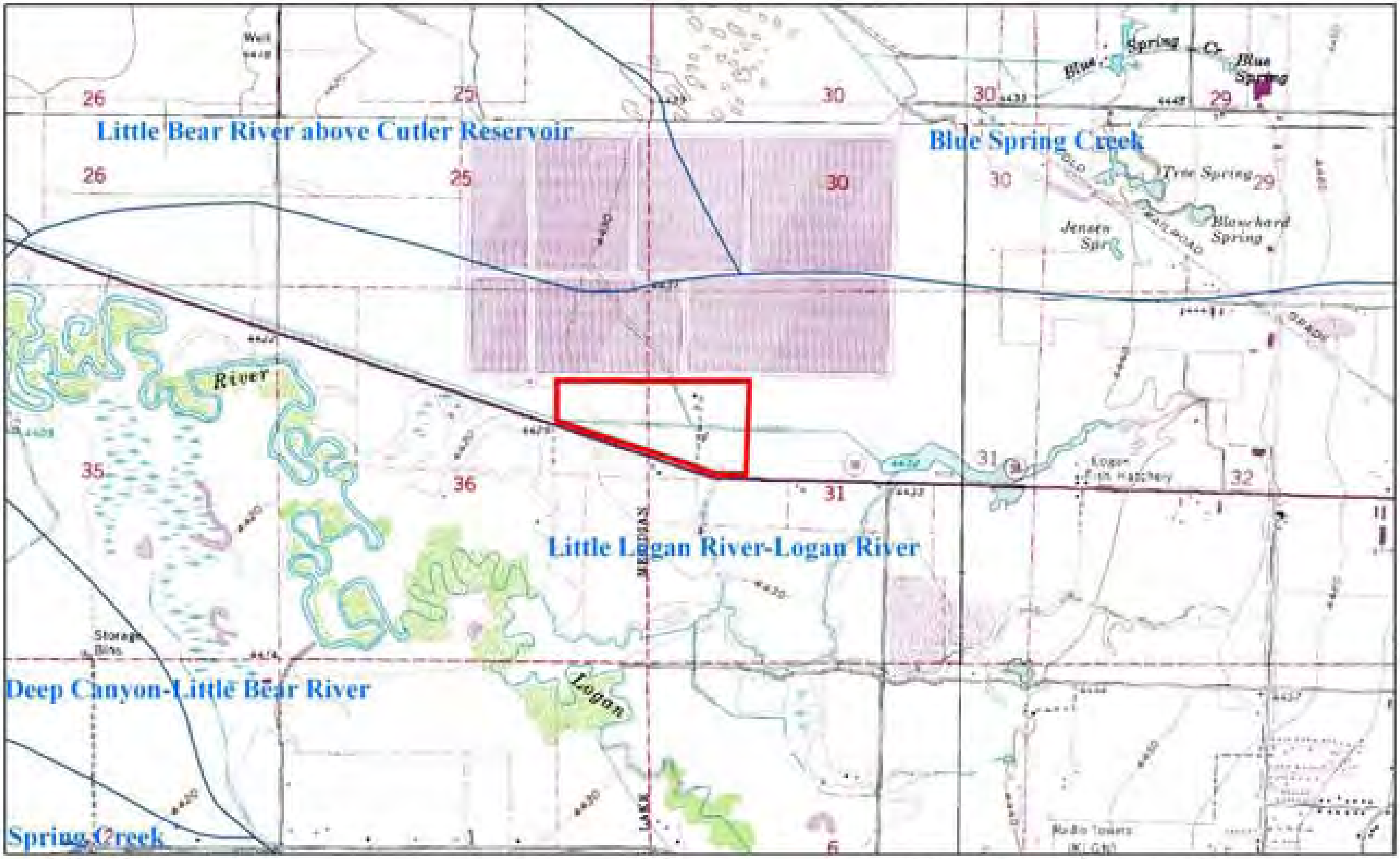

12-042-0004
05-057-0007
12-042-0005
05-057-0001
05-057-0005
05-057-0004
12-042-0003
12-042-0021
12-042-0013
12-042-0012
05-059-0002
05-059-0004
05-059-0012
05-059-0005
05-059-0013
Property
Parcels
Parcels from AGRC
Logan Wastewater Expansion Area
0
1,520
Feet

Figure 2-2



12th Code HUC
Logan Wastewater Expansion Area

Figure 2-3

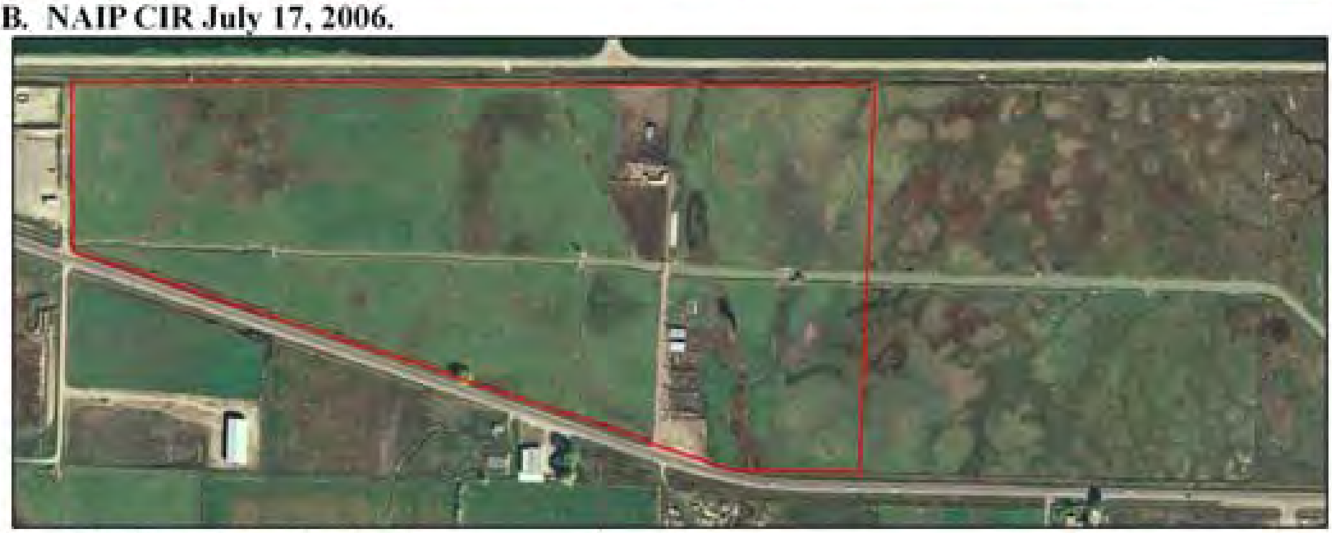
0 6,800
Feet

Imagery

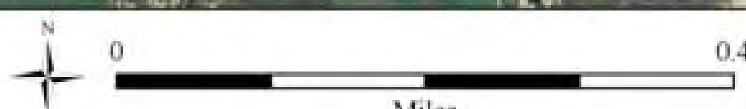
Figure 2-4

A. NAIP August 26, 2003.

B. NAIP CIR July 17, 2006.



C. HRO September 30, 2006.



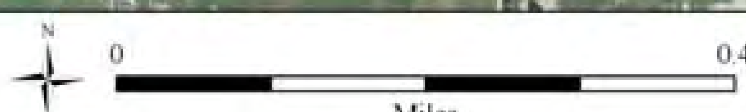
Imagery

Figure 2-4

D. NAIP July 9, 2009.

E. HRO October 21, 2009.

F. NAIP August 10, 2011.

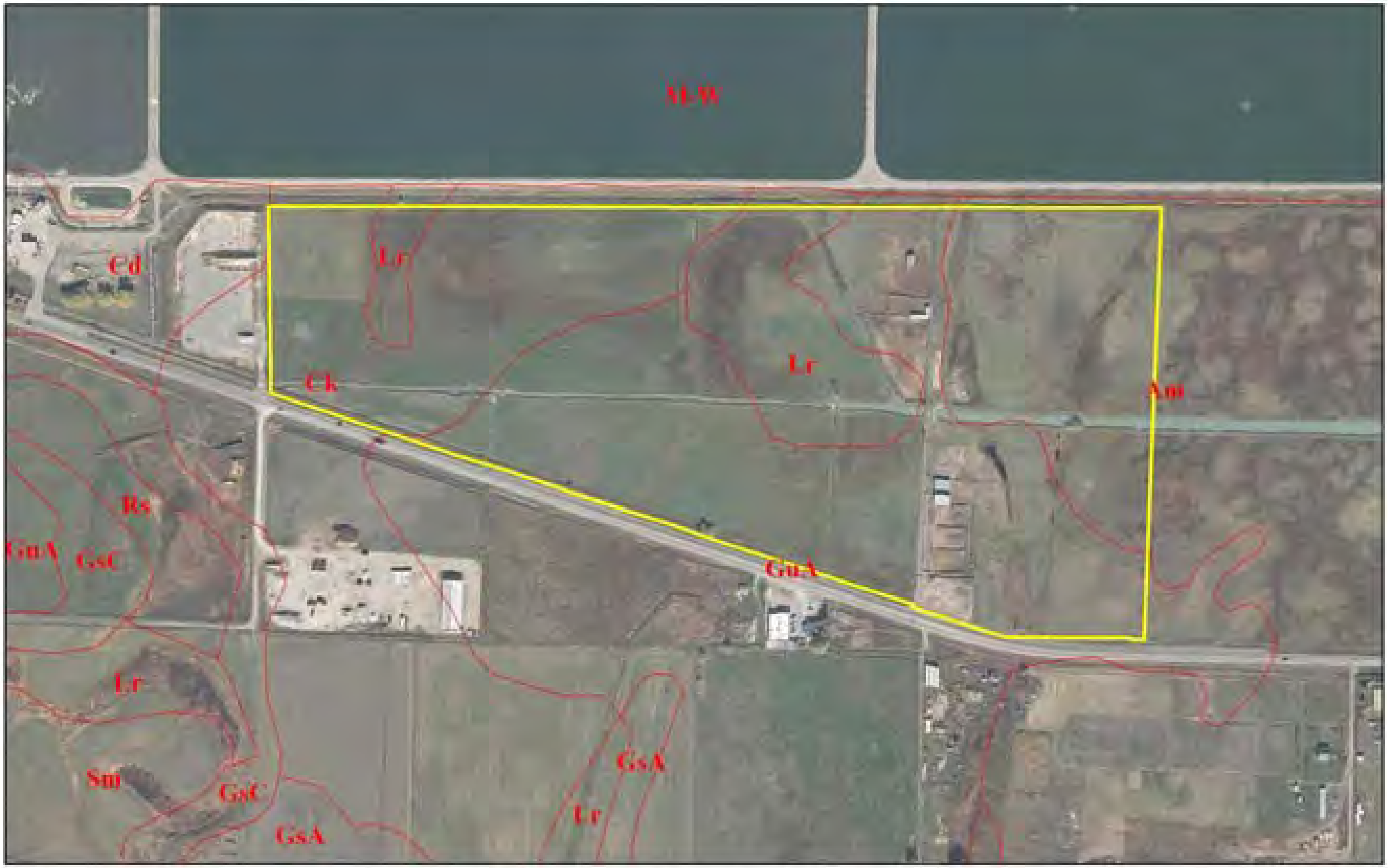


The NRCS identified three soil map units in the property (Figure 2-5 and Table 2-1). The named soil is hydric for about 20.4 acres (32 percent) of the property. Brief descriptions of the five major soil components follow.

Table 2-1. NRCS soil map units.						
Soil Map Unit		Subgroup Class	Drainage Class	Hydric?	Area	
Symbol	Name				(acres)	(%)
Am	Airport-Salt Lake complex	Typic Natraquoll/Calciaquoll	Poor/very poor	Yes	12.1	19.2
Ck	Collett silty clay loam	Aquic Calciustoll	Somewhat poor	No	14.0	22.3
Lr	Logan silty clay loam	Typic Calciaquoll	Poor	Yes	8.3	13.3
GuA	Greenson loam	Aquic Calciustoll	Somewhat poor	No	28.5	45.3
TOTAL					**102.9**	**100.0**

Airport silty clay loam: This component makes up 55 percent of the Am map unit. Slopes are 0 to 1 percent on lake terraces. The parent material consists of lacustrine deposits derived from quartzite and/or limestone. Depth to a root restrictive layer is greater than 60 inches. Soil is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is rarely flooded and is not ponded. A seasonal zone of water saturation is at 12 inches during April, May, June, July, August, and September. Organic matter content in the surface horizon is about 2 percent. This component is in the Alkali bottom (alkali Sacaton) ecological site. This soil meets hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 45 percent. The soil has a strongly saline horizon within 30 inches of the soil surface. The soil has a strongly sodic horizon within 30 inches of the soil surface.

Salt Lake silty clay: This component makes up 40 percent of the Am map unit and is the principal component of the Se map unit. Slopes are 0 to 1 percent on lake terraces. The parent material consists of lacustrine deposits derived from quartzite and/or limestone. Depth to a root restrictive layer is greater than 60 inches. Soil is very poorly drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is high. Shrink-swell potential is high. This soil is frequently flooded but is not ponded. A seasonal zone of water saturation is at 15 inches during April, May, June, July, and August. Organic matter content in the surface horizon is about 14 percent. This component is in the Wet Saline Meadow ecological site. This soil meets hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 40 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.



Am: Airport-Salt Lake complex
Ck: Collett silty clay loam
GuA: Greenson loam
Lr: Logan silty clay loam
M-W: Miscellaneous water

Cache County Soil Survey
Logan Wastewater Facility Property

Figure 2-5

0.2
Miles

Collett silty clay loam: This component makes up 95 percent of the Ck map unit. Slopes are 0 to 3 percent on lake terraces. The parent material consists of lacustrine deposits derived from limestone, sandstone, and shale. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded and is not ponded. A seasonal zone of water saturation is at 27 inches during May, June, July, August, and September. Organic matter content in the surface horizon is about 3 percent. This component is in the Semiwet Fresh Meadow ecological site. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 43 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Logan silty clay loam: The component makes up 90 percent of the Lr map unit. Slopes are 0 to 3 percent on lake terraces. The parent material consists of alluvium and lacustrine deposits derived from limestone, sandstone and quartzite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is high. Shrink-swell potential is high. This soil is rarely flooded and is not ponded. A seasonal zone of water saturation is at 20 inches during May, June, July, August, and September. Organic matter content in the surface horizon is about 6 percent. This component is in the Wet Fresh Meadow ecological site. This soil meets hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 38 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Greenson loam (GsA): This series consists of somewhat poorly drained and moderately well drained soils. It comprises about 12.8 acres (62 percent) of the property. The soil formed in mixed lake sediment and alluvium from limestone, sandstone, and quartzite. It occurs on low lake terraces and fans. The vegetation is saltgrass, foxtail, alkali sacaton, Kentucky bluegrass, and some sedges and wiregrass. The Greenson soil is classified Aquic Calciustolls at the subgroup level. This soil is <u>not</u> hydric. Inclusions of Logan soil (hydric) comprise about 5 percent of the map unit.

The National Wetland Inventory (NWI) map (Figure 2-6) identifies 8 parcels of Palustrine emergent seasonally flooded (PEMc) wetland totaling 4.4 acres (7.1 percent) and one parcel of Palustrine emergent temporarily flooded (PEMa) that covers 0.5 acres (0.8 percent) of the property.

The property supports irrigated pasture hay. The central canal that bisects the property is not marked on a 1957 quadrangle map but is marked on a 1963 map. Mr. Jeff Eliason remembers the canal being present in the 1960s. Mr. Lane Parker recalled Jeff's father telling him that the canal once carried sewage from Logan City that grew very good grass. The property has been intensively irrigated for more than 50 years. The west half of the property was usually cut for grass hay. The east half of the property was grazed by cattle and horses and not cut.

Figure 2-6

National Wetland Inventory
Logan Wastewater Facility Property

PEMa: Palustrine emergent, temporarily flooded
PEMc: Palustrine emergent seasonally flooded
L2ABGx: Lacustrine littoral unconsolidated bottom, intermittently exposed (excavated)
L2USCx: Lacustrine littoral unconsolidated shore, seasonally flooded (excavated)

3.0 APPROACH

A routine wetland delineation according to techniques specified in the 1987 Wetland Delineation Manual and the 2007 Arid West Supplement. Field studies were conducted between mid-September and early-November, 2012. A base map (Figures 3.1) was prepared using the 2009 HRO image registered to UTM (meters), NAD83, Zone 12N.

Sherman Jensen (Soil Scientist/Physical Ecologist) described soils and hydrology. Spade holes were excavated to a depth of about 20 inches and a profile was cut from the edge of the pit; a mud auger was used to exhume soil material to a depth of about 48 inches for representative sites[1]. Frank Smith (Botanist) identified vegetation. Sixteen (16) sites were described (Figure 3-2). Addition photopoints were established to provide a visual overview of the property (Figure 3-3).

Indicators given in the Arid West Supplement can be used to identify all wetlands, whether natural or created artificially by human activity. The appropriate Corps of Engineers District Regulatory Office should be consulted when it is necessary to distinguish between naturally occurring and irrigation-induced wetlands for Clean Water Act regulatory purposes. A memo from the Sacramento District USACE (APPENDIX D) served as guidance for evaluating irrigated wetland.

[1] Deeper soil material served as a basis for identifying perched water table.

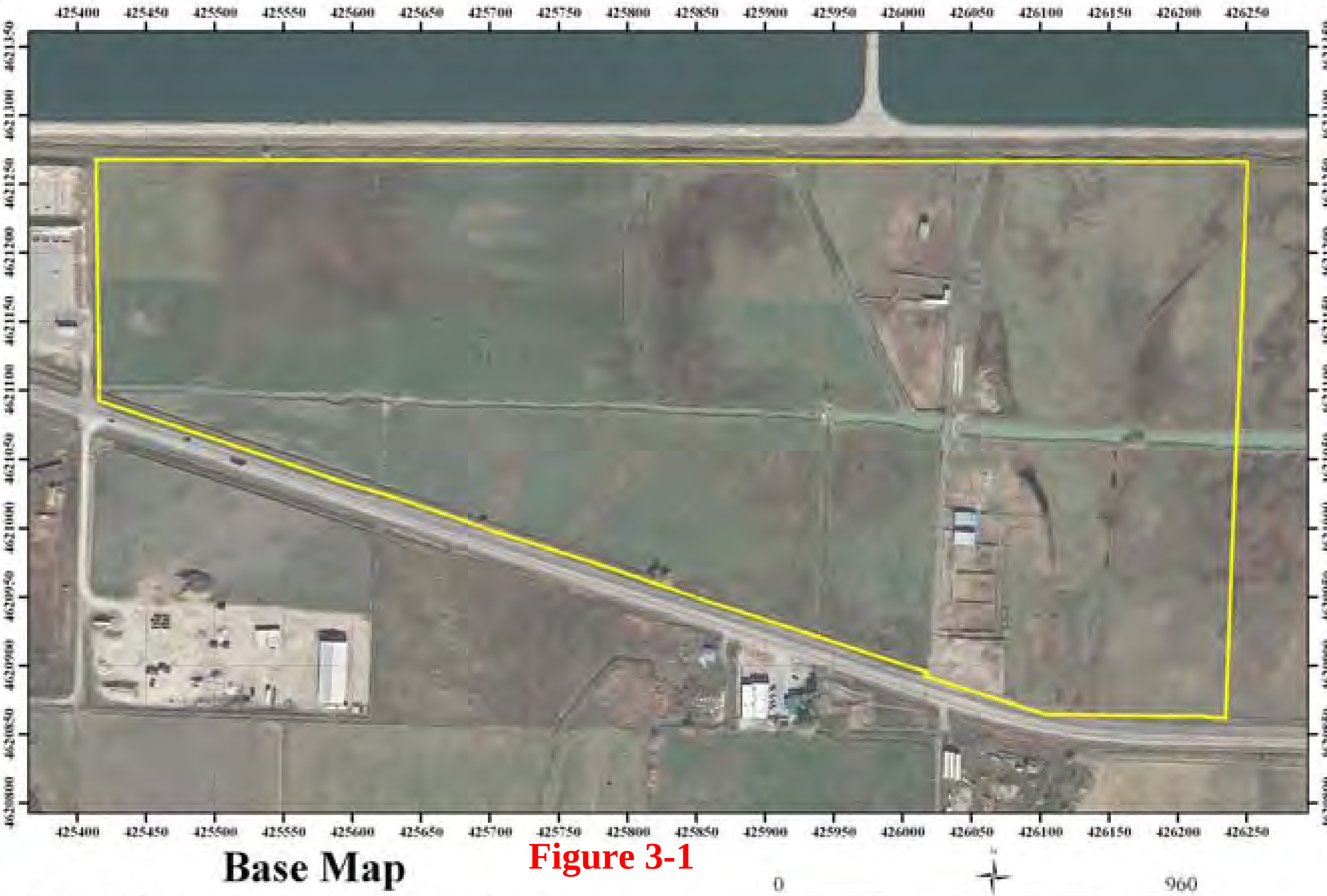


Figure 3-1

Base Map

Logan Wastewater Expansion Area

Note: Image is High Resolution Orthophoto (HRO) with 1 foot resolution dated October 21, 2009. Coordinates are UTM (meters), NAD83, Zone 12N.

Descriptions
Logan Wastewater Expansion Area

Figure 3-2

Note: Description symbols are linked to USACE Arid West forms in APPENDIX B. Coordinates are UTM (meters), NAD83, Zone 12N.

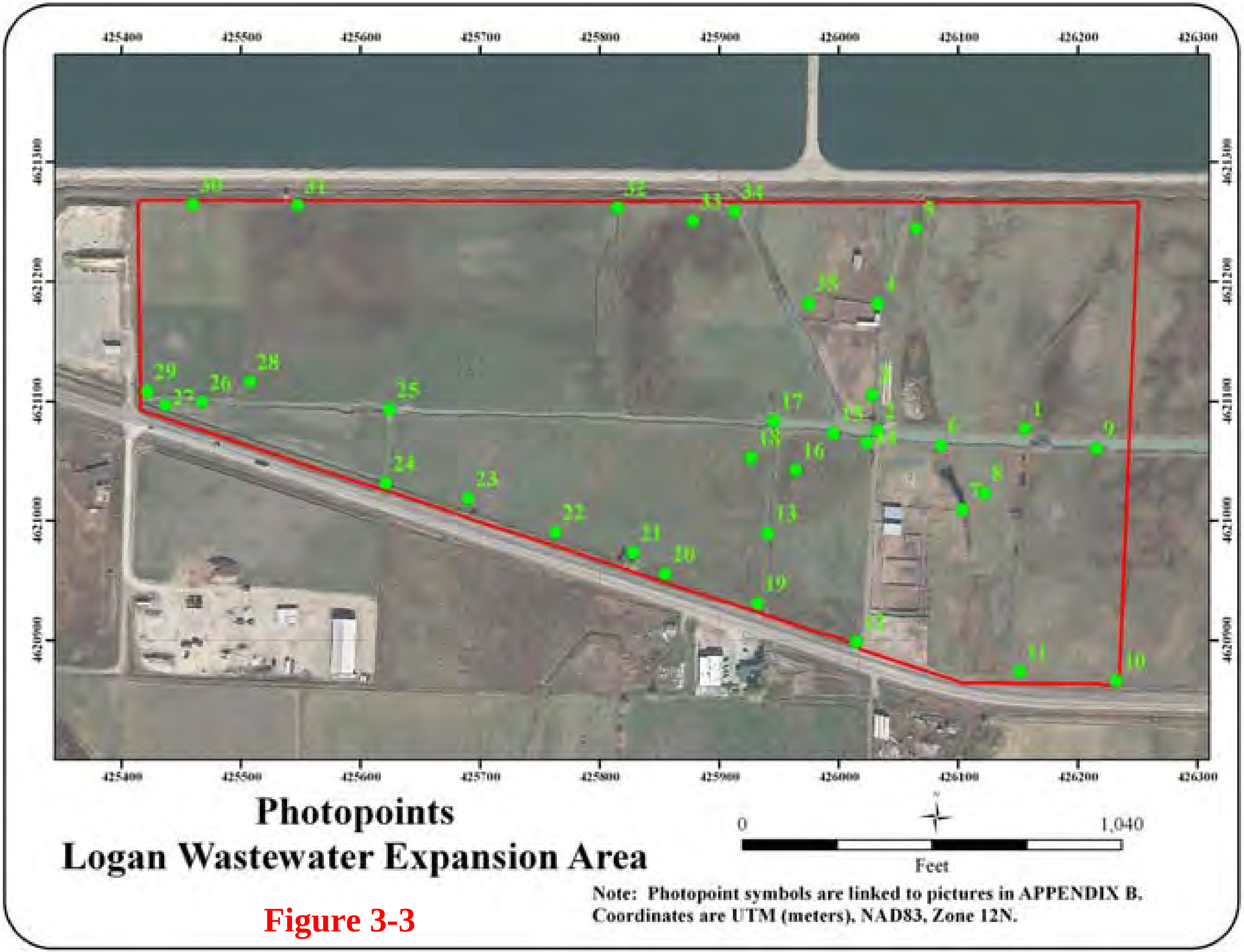
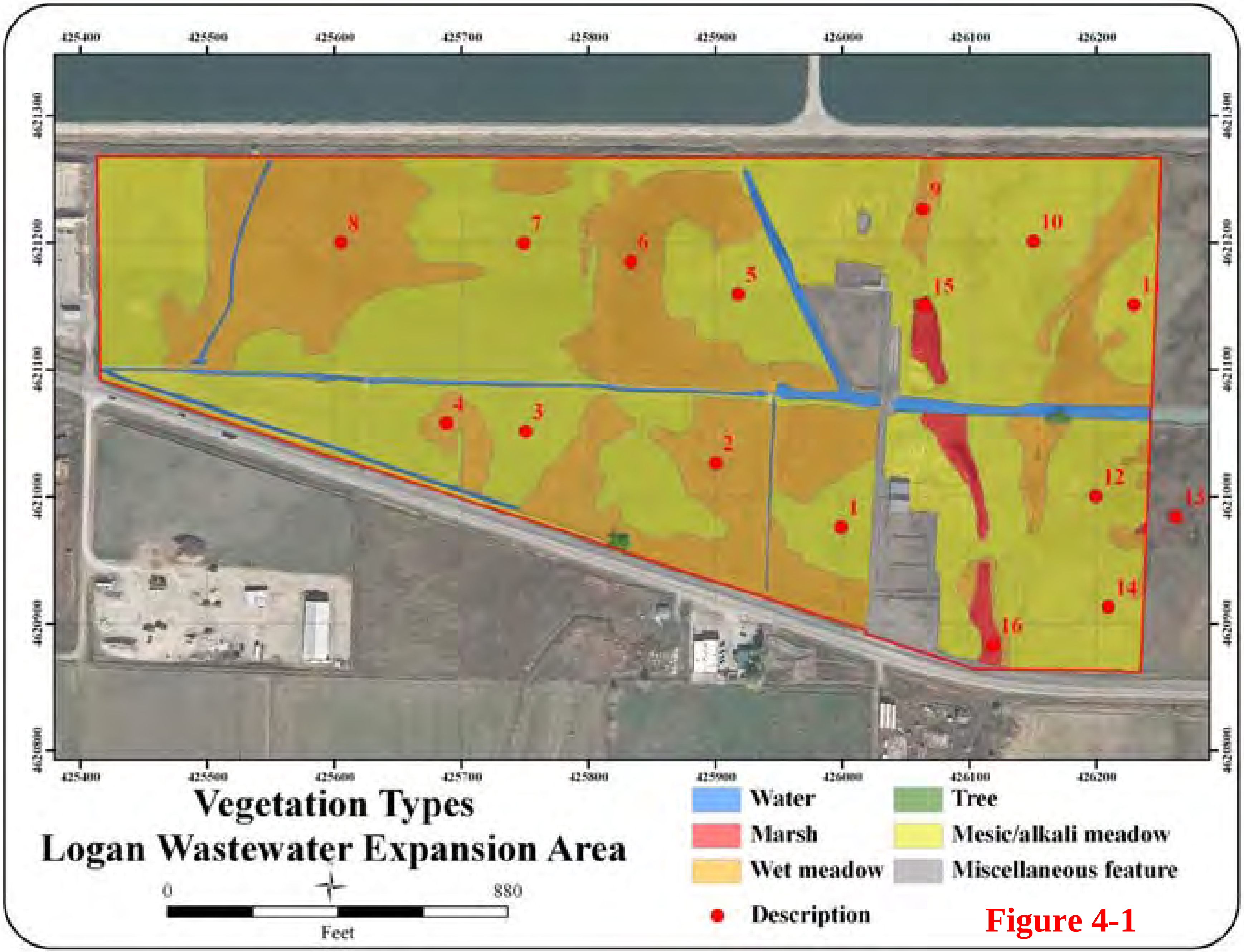

425400
425500
425600
425700
425800
425900
426000
426100
426200
426300
4621300
4621200
4621100
4621000
4620900
Photopoints
Logan Wastewater Expansion Area
0
1,040
Feet
Note: Photopoint symbols are linked to pictures in APPENDIX B.
Coordinates are UTM (meters), NAD83, Zone 12N.

Figure 3-3

4.0 RESULTS

Field descriptions of vegetation, hydrology and soils on forms from the 2008 Arid West Manual are collected in APPENDIX A. Overview photographs are collected in APPENDIX B. A list of plant species is included as APPENDIX C.

Areas with distinctive soil, hydrology, and vegetation were delineated. Six features types were identified (Figure 4-1).



Vegetation Types
Logan Wastewater Expansion Area
Water
Marsh
Wet meadow
Tree
Mesic/alkali meadow
Miscellaneous feature
Description
0
880
Feet

Figure 4-1

4.1 Water

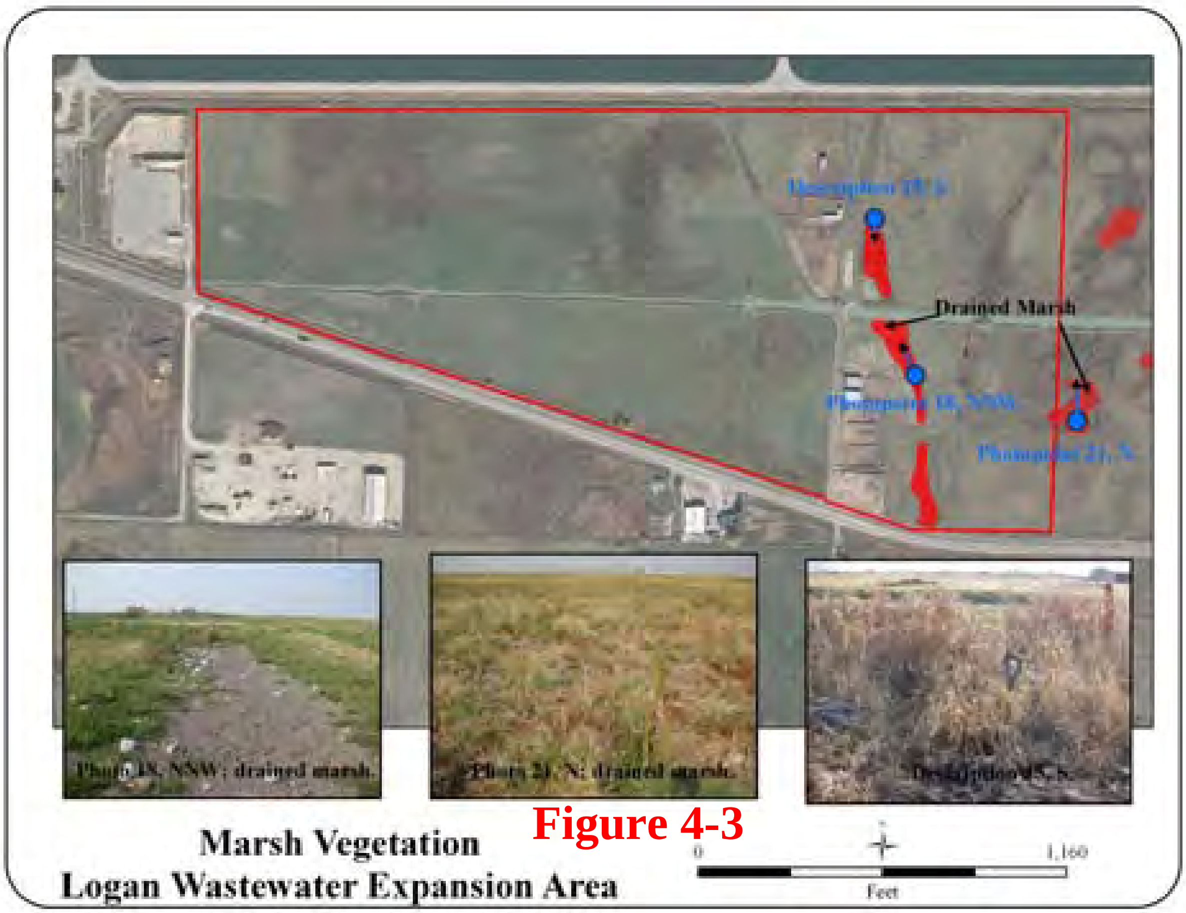
Nine parcels comprise 1.8 acres (3 percent) of the property and correspond with canals and major distributary ditches. Irrigation structures on the main canal can be used to raise water level 2-3 feet to facilitate distribution of water north and south of the central canal. Many culverts, several minor distributary ditches, and buried pipelines (none of which were mapped) further augment distribution of irrigation. The status of these features was *not considered*.

Figure 4-2 Open Water
Logan Wastewater Expansion Area

4.2 Irrigated Marsh

Four parcels, including areas that were recently drained, comprise 1.0 acres (3 percent) of the property (Figure 4-3) and three sites (13, 15, and 16) were described. *Irrigated marsh* occurs in the lowest concave positions. Areas of *irrigated wet meadow* transitional to *irrigated marsh* are common.

Typical dominant plants are common threesquare, hardstem bulrush, cattail and common spikerush; the prevalence index was <1.2. One site (13) was historically sustained by overflow from an artesian well that was recently capped. This drained marsh has reverted to a sparse distribution of obligate, facultative, facultative upland, and upland plants (prevalence index = 2.8) with less than 50 percent total cover. Another marsh cut off from irritation has dried up completely (see Photopoint 7). Hydrophytic vegetation was present in all parcels described.



Saturated surface soil horizons typically include mucky, black (10YR2/1) layers with silt loam, loam, and/or silty clay loam texture that are 4 to 6 inches thick (Figure 4-4). At sites 15 and 16, subsoils were dark gray (10YR4/1) silt loam about 12 inches thick; at site 13, a black (10YR2/1) mineral horizon 9 inches thick subtended the surface muck. Deeper strata are typically gray (10YR5/1, 6/1, or 7/1), enriched with secondary carbonate, and variable texture. Saturated soil rests on a relatively impermeable clay layer that is not saturated at a depth of 2 to 3 feet. Hydric soils were present (criterion F1 Loamy Mucky Mineral) in response to long term saturation by surface irrigation.

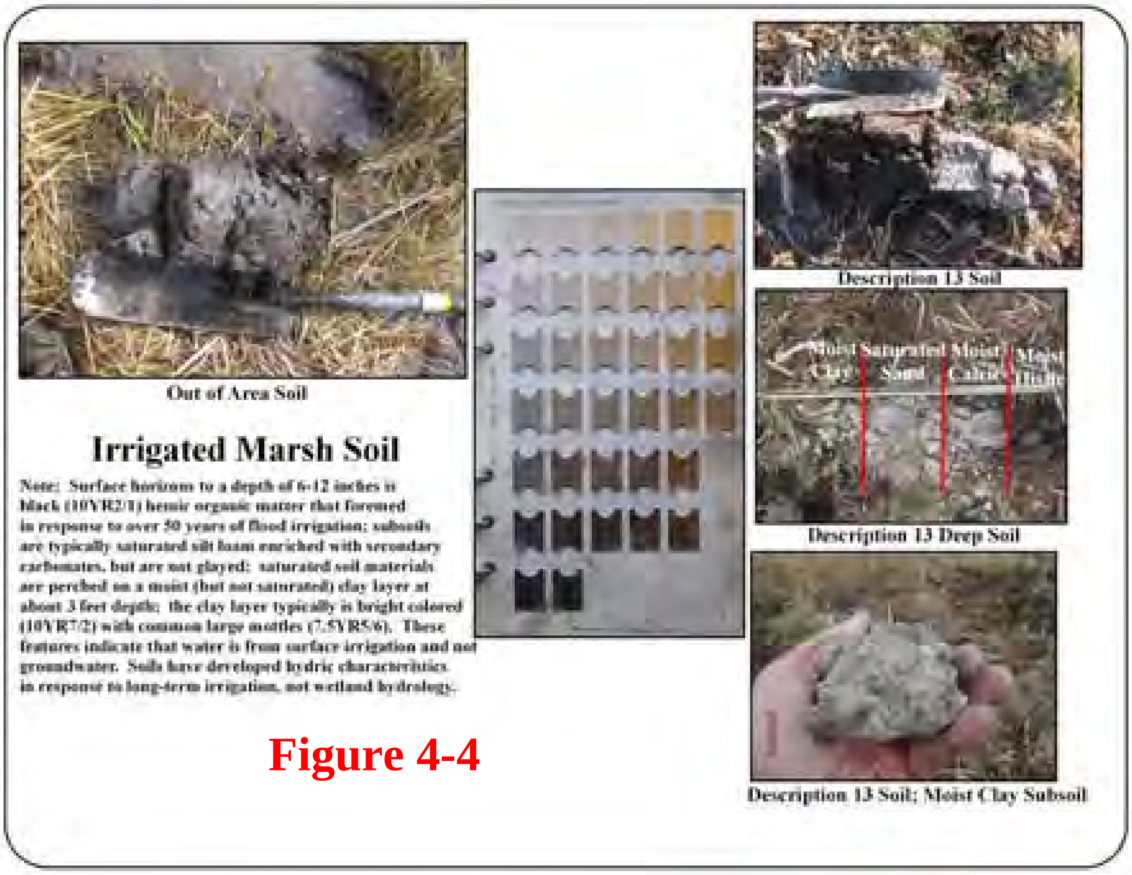


Figure 4-4

Wetland hydrology indicators include surface water, high water table, and saturation that are all a direct response to irrigation. Surface water, high water table, and saturation are all perched on impermeable clay substrate at a depth of 2-3 feet. Similar perched conditions were observed for *irrigated wet meadow* and moist areas of *mesic/alkali meadow* vegetation types. Wetland hydrology is not present.

These areas include irrigated wetland that is not regulated under the Clean Water Act.

4.3 Irrigated Wet Meadow

Twelve parcels comprise 20.1 acres (32 percent) of the property (Figure 4-5). *Irrigated wet meadow* occurs in broad concave positions that are regularly flooded by irrigation and include areas that are transitional to *irrigated marsh* vegetation. Boundaries with *mesic/alkali* meadow are often subtle. Five sites were described (2, 4, 6, 8, and 9).

Dominant vegetation includes Nebraska sedge, spreading bentgrass, foxtail barley, reed canary grass, common spikerush, and saltgrass. All dominant plants were OBL, FACW, or FAC for all six sites. The prevalence index ranged from 1.3 to 1.8. Hydrophytic vegetation was present for all sites.

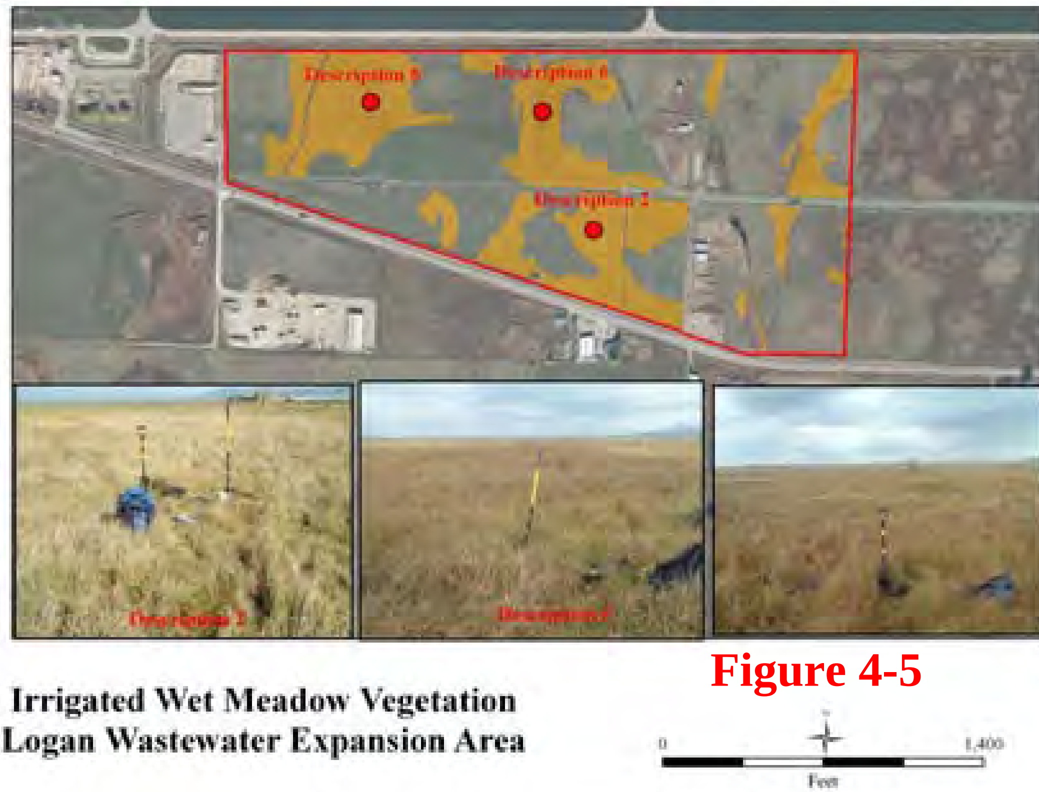
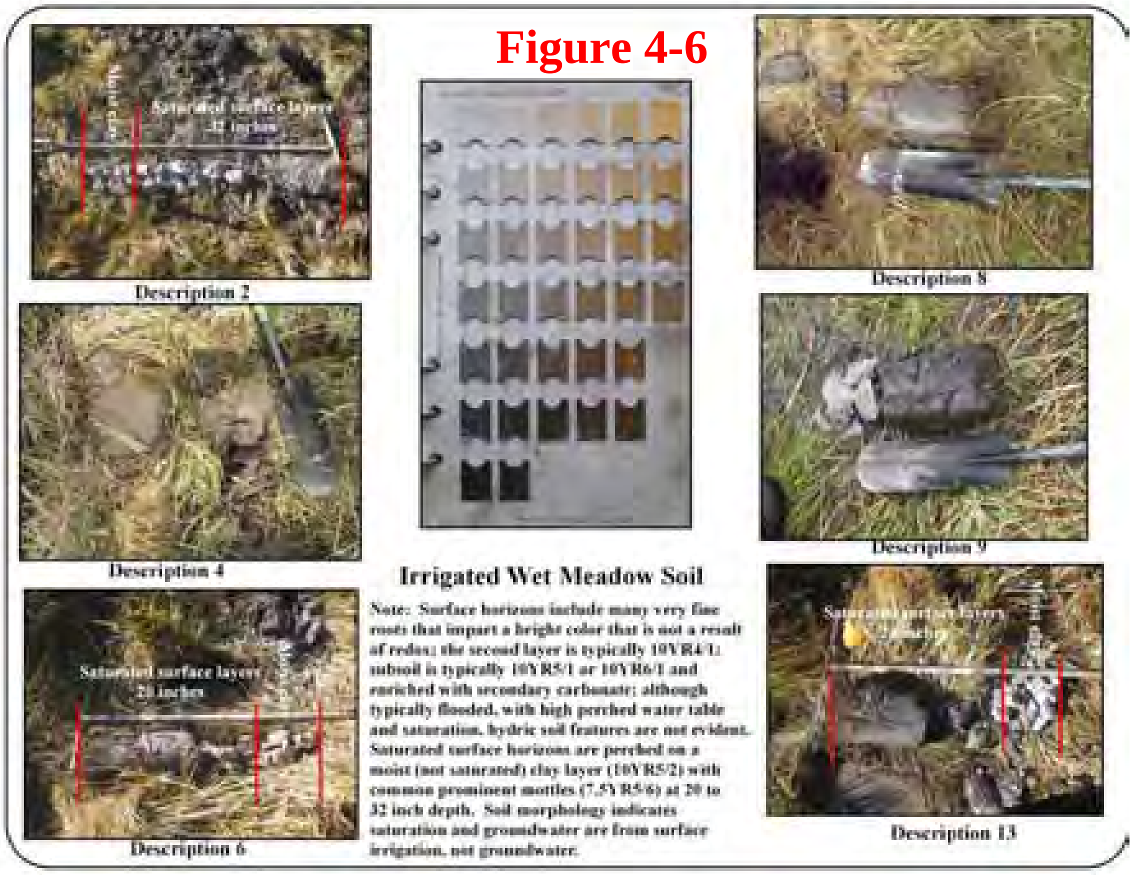


Figure 4-5

Irrigated Wet Meadow Vegetation
Logan Wastewater Expansion Area

Saturated surface soil horizons about 4 inches thick are typically brown (10YR4/3) loam or silt loam with many very fine roots (Figure 4-6). Saturated subsoils are dark gray (10YR4/1) silt loam, silty clay loam, or clay loam about 12 inches thick. A light gray (10YR7/1) to white (10YR8/1) saturated layer enriched with secondary carbonates extents from about 16 to 24 inches. Saturated layers are perched on a moist (<u>not</u> saturated), pale brown clay layer with common prominent mottles (7.5YR5/6) at about 24 inches. Hydric soil indicators were not evident.



Wetland hydrology indicators include surface water, high water table, and saturation that are all a direct response to irrigation. Surface water, high water table, and saturation are all perched on impermeable clay substrate at a depth of 2 to 3 feet. Similar perched conditions were observed for *irrigated marsh* and moist areas of *mesic/alkali meadow* vegetation types. Wetland hydrology is not present.

These areas are irrigated wetland that is not regulated under the Clean Water Act.

4.4 Mesic/Alkali Meadow

Eight (8) parcels of this vegetation type comprise 36.7 acres (58 percent) of the property (Figure 4-7). It occurs on the highest convex positions; surfaces in the west half of the property have been somewhat leveled by long-term cutting/bailing of pasture grass; a hummocky relief remains evident in the east part of the property. Eight sites were described (1, 3, 5, 7, 10, 11, 12 and 14).

Dominant species were saltgrass, meadow fescue, clustered field sedge, quackgrass, common timothy, spreading bentgrass, foxtail barely, and cheatgrass. More than half of the dominant plants were OBL, FACW, or FAC for four sites and less than half for six sites. The prevalence index ranged from 2.7 to 3.7. Accepting either the dominance or prevalence criteria, hydrophytic vegetation was <u>absent</u> in five sites and <u>present</u> in three sites (10, 11, and 12).

Figure 4-7

Mesic/Alkali Meadow Vegetation
Logan Wastewater Expansion Area

The surface soil horizon is typically brown (10YR4/3) to dark gray (10YR4/1) loam or silt loam about 4 inches thick with many very fine roots (Figure 4-8). Moist subsoils are dark grayish brown (10YR4/2) loam or silt loam, 8 to 12 inches thick. A saturated subsoil with variable texture rests on moist (not saturated), mottled clay at a depth of 3 to 4 feet. Secondary carbonate leached from surface horizons is present in subsoil. Hummocks in the east part of the property have sodic subsoil. Similar to *irrigated marsh* and *irrigated wet meadow*, subsoil is saturated by surface irrigation perched on relatively impermeable clay. *Mesic/alkali meadow* soils are not hydric.

Figure 4-8

A water table was present at a depth of about 24 inches and soils were saturated below a depth of about 20 inches. Similar to that described for *irrigated marsh* and *irrigated wet meadow* vegetation types, the water table and saturation are perched on a moist (but not saturated) clay layer at a depth of 3 to 4 feet. Water table and saturation are in response to surface irrigation, not groundwater. Wetland hydrology is not present.

These areas include irrigated wetland that is not regulated under the Clean Water Act.

4.5 Tree

Two trees comprise 0.1 acres (0.1 percent) of the property (Figure 4-9). The trees (crack willow and Russian olive) were considered part of the surrounding *irrigated wet* meadow. Hydrophytic vegetation was present; soils may be hydric or not hydric; wetland hydrology was not present; these areas are upland.

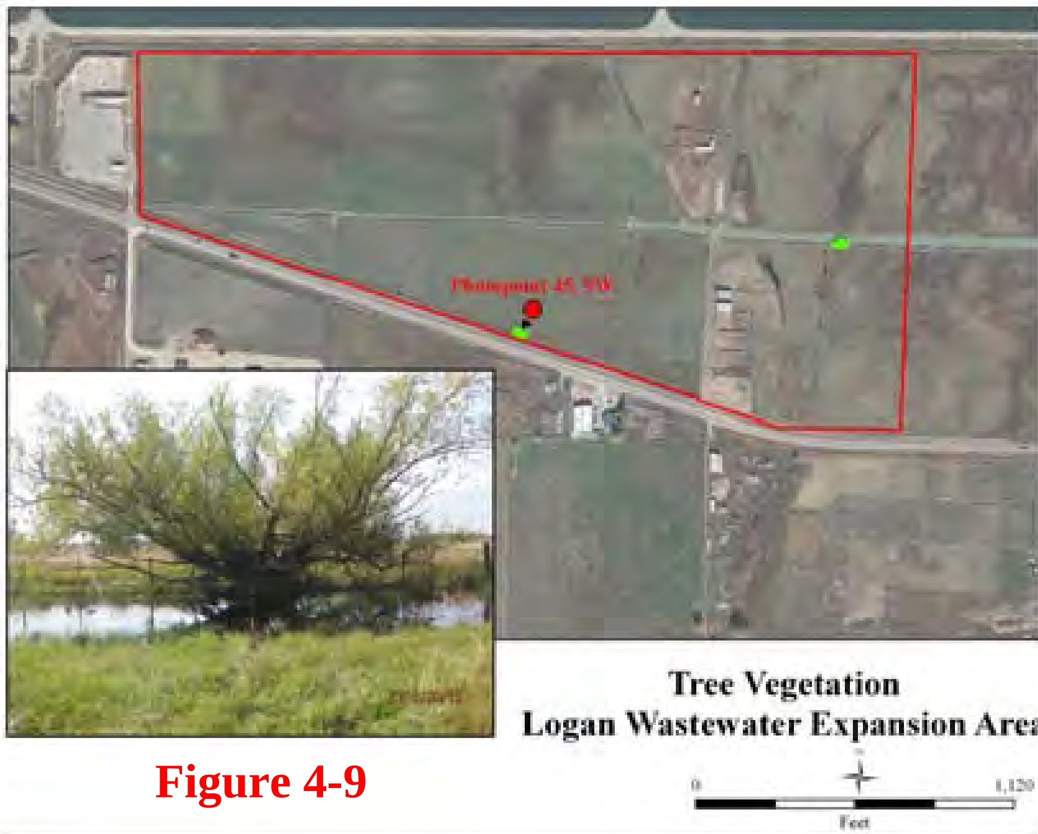


Figure 4-9

4.6 Miscellaneous Features.

Four (4) *buildings*, 2 *corals*, a *hay stack*, 2 *irrigation structures*, and a *road* comprise 3.2 acres (5 percent) of the property (Figure 4-10). Hydrophytic vegetation, hydric soil, and wetland hydrology were not evident. The status of these areas is *upland.*

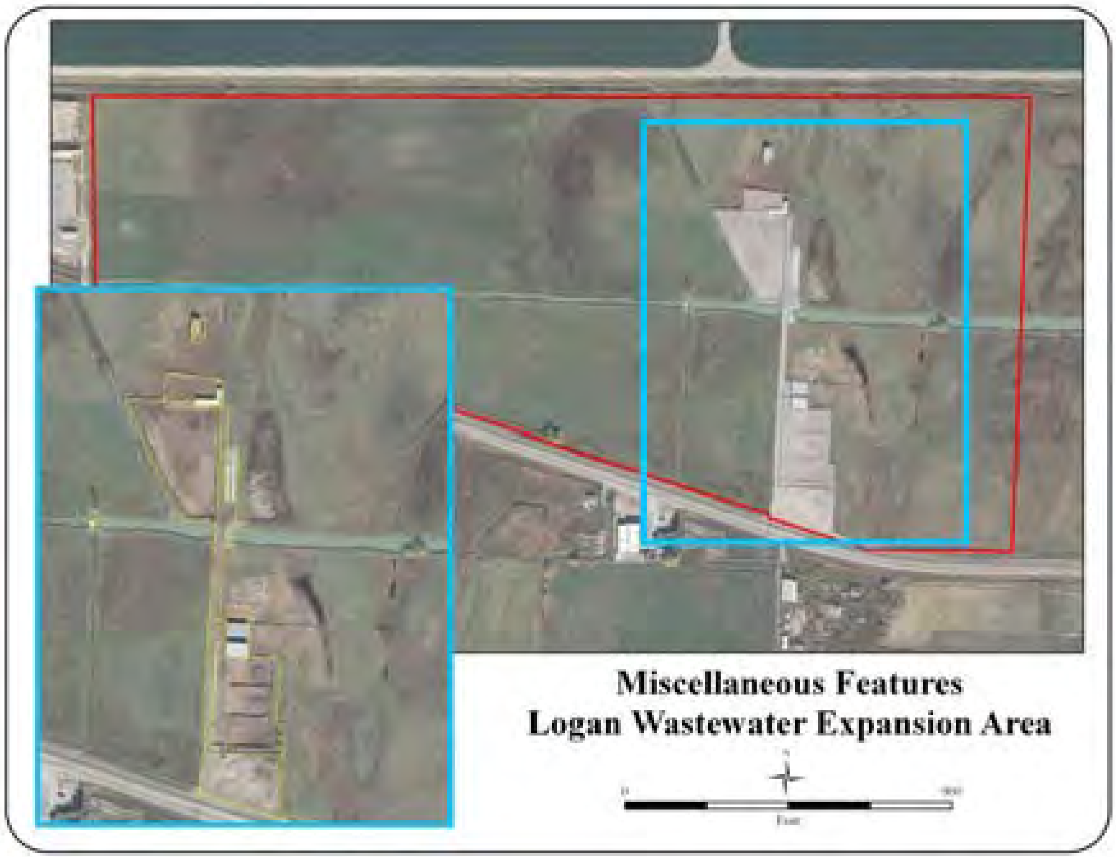


Figure 4-10

4.7 Summary/Status

Five major vegetation types and miscellaneous features were identified:

> ***Water:*** Irrigation canals and ditches for which the jurisdictional status was not considered.
>
> ***Irrigated marsh:*** hydrophytic vegetation was present; hydric soil was present; surface water, water table, and saturation were perched on an impermeable clay layer; water features are a response to irrigation, <u>not</u> wetland hydrology. These areas are irrigated wetland.
>
> ***Irrigated wet meadow:*** hydrophytic vegetation was present; hydric soil was present in some sites, but not in others; surface water, water table, and saturation were perched on impermeable clay layer; water features are a response to irrigation, <u>not</u> wetland hydrology. These areas are irrigated wetland.
>
> ***Mesic/alkali meadow:*** hydrophytic vegetation was present in some areas, but not in others; hydric soil was not present; water table and saturation were typically present at a depth below 18 inches and were perched on an impermeable clay layer. Water features are a response to irrigation, <u>not</u> wetland hydrology. These areas may include irrigated wetland.
>
> ***Miscellaneous features:*** These include buildings, corals, hay stack, irrigation structures, and road that are not wetland.

USACE Regulatory Branch Memo CESPK-CO-R (1145) states areas exhibiting wetland characteristics sustained solely by application of irrigation water are not regulated under Section 404 of the Clean Water Act (see APPENDIX D). A sure way to prove irrigation is sustaining a wetland is to discontinue irrigation and evaluate the results, typically requiring two or more growing seasons. Logan City is under a regulatory deadline to reduce phosphorous levels in wastewater and cannot wait two or more growing seasons before constructing the tertiary treatment facility. If eliminating irrigation is not practical, the USACE procedure for documenting irrigated wetland entails conducting on-site study and evaluating soil information, water records, climate data, information from landowners, and aerial photography.

Field studies indicate that surface water, shallow saturated soils, and perched water tables are a response to surface irrigation, not local groundwater. A relatively impermeable clay layer limits the downward percolation of irrigation. The top of the clay layer has bright matrix color, bright mottles, and was not saturated. The clay layer gets drier with depth from the surface These observations clearly demonstrate hydrophytic vegetation is sustained by surface irrigation and not groundwater. Field studies also indicate that only the wettest areas (*irrigated marsh*) have developed hydric soil indicators.

NRCS soil information indicates about 32 percent of the property is hydric soil (Airport and Salt Lake series) that evolved in response to surface flooding (not groundwater). Both hydric soils have shallow layers with reduced (anaerobic, glayed) colors over deeper layers with oxidized (aerobic, bright) colors; both soils also have subsurface horizons enriched by secondary carbonates leached from surface horizons. The character of hydric soils on the property clearly indicates they were sustained by surface water. Natural sources of surface water have been eliminated by the Logan City wastewater ponds immediately north of the property. The only remaining source of surface water is irrigation.

The property has been flood irrigated since at least the early 1960s. Anecdotal reports indicate it may have been irrigated as early as the 1940s. Recent owners indicate that in years when irrigation is reduced, wetland vegetation production declines significantly and shifts to drier vegetation are evident. *Irrigated marsh* has dried up or is in the process of drying up in several areas where irrigation was inadvertently eliminated in recent years. Boundaries between *irrigated wet meadow* and *mesic/alkali meadow* are blurred where differences in available irrigation in successive years results in differences in effective water spreading.

Status is summarized in Table 4-1. The status of *water* was not considered (NC). Hydrophytic vegetation and hydric soil were evident for *irrigated marsh*, but not wetland hydrology. Hydrophytic vegetation was present for *irrigated wet meadow* and *tree*, but not hydric soil or wetland hydrology. Hydrophytic vegetation was present for some *mesic/alkali meadow*, but hydric soil and wetland hydrology were not present. No wetland regulated under Section 404 of the Clean Water Act was identified in the property.

Table 4-1. Vegetation status summary.

CLASS	N	Area		Hydric Status			Wetland?
		(acres)	(%)	Vegetation	Soil	Hydrology	
Water	9	1.8	2.9	NC	NC	NC	NC
Irrigated marsh	4	1.0	1.6	YES	YES	NO	NO
Irrigated wet meadow	12	20.1	31.9	YES	NO/YES	NO	NO
Mesic/alkali meadow	8	36.7	58.4	NO/YES	NO	NO	NO
Tree	2	0.1	0.1	YES	NO	NO	NO
Building	4	0.2	0.4	NO	NO	NO	NO
Coral	2	1.7	2.7	NO	NO	NO	NO
Hay stack	1	0.2	0.2	NO	NO	NO	NO
Irrigation structure	2	<0.1	<0.1	NO	NO	NO	NO
Road	1	1.0	1.6	NO	NO	NO	NO
TOTAL	**129**	**62.9**	**100.0**	**--**	**--**	**--**	**--**

5.0 LITERATURE CITED

USACE. 1987. Wetlands delineation manual. Technical Report Y-87-1. Environmental Laboratory, Department of the Army, Waterways Experiment Station, Corps of Engineers; Vicksburg, Mississippi. 143 pp.

USACE 2008. Regional supplement to the Corp of Engineers wetland delineation manual: Arid West Region (Version 2). ERDS/EL TR-08-28. Arid Environmental Laboratory, Department of the Army, Waterways Experiment Station, Corps of Engineers; Vicksburg, Mississippi. 135 pp.

APPENDIX A

FIELD DESCRIPTION FORMS

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 27, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 1

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): broadly convex Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Greenson loam; Aquic Calciustoll; not hydric; NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✓ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓
Is the Sampled Area within a Wetland?		✓

Remarks:

Grass hay/pasture; area historically cut for grass hay; topography subdued; excessively irrigated; 426000/4620975; area is considerably wetter than typical because of late season irrigation; mesic/alkali meadow veg type;

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 100m)			
1. Distichlis spicata	40	YES	FAC
2. Medicago sativa	1	NO	NL
3. Festuca pratensis	40	YES	FACU
4. Agropyron repens	10	NO	NL
5. Chenopode (collected)	5	NO	
6.			
7.			
8.			
= Total Cover	96		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	50	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species	40	x 3 =	120
FACU species	40	x 4 =	160
UPL species	16	x 5 =	80
Column Totals:	96	(A)	360 (B)

Prevalence Index = B/A = 3.75

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR4/3	100	--				Loam	many vf roots;
4-8	10YR4/2	100	--				Loam	moist
8=16+	10YR4/2	100	--				Loam	moist; good structure;

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? **Yes** ______ **No** ✓

Remarks:

No hydric soil indicators evident;

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ____________

Water Table Present? Yes ______ No ✓ Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ____________

Wetland Hydrology Present? **Yes** ______ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 27, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 2

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): broadly concave Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Greenson loam; Aquic Calciustoll; not hydric; NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✓ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:

4621025/425900; irrigated wet meadow veg type; Irrigated throughout growing season; area is considerably wetter than typical because of late season irrigation;

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1. (HERB STRATUM CONTINUED)			
2. Carex praegracilis	10	Y	FACW
3. Alopecurus pratensis	5	N	FACW
4. Phalarus arundinaceae	1	N	FACW
5. Beckmannia syzigachne	1	N	OBL
= Total Cover			
Herb Stratum (Plot size: 100m)			
1. Carex nebrascensis	40	Y	OBL
2. Juncus articus	5	N	FACW
3. Hordeum jubatum	10	Y	FAC
4. Triglochin maratima	2	N	OBL
5. Phalarus arundinacea	5	N	FACW
6. Poa pratensis	3	N	FAC
7. Agrostis stolonifera	10	Y	FACW
8. Eloocharis palustris	5	N	OBL
= Total Cover	97		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	48	x 1 =	48
FACW species	36	x 2 =	72
FAC species	13	x 3 =	39
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	97 (A)		159 (B)

Prevalence Index = B/A = 1.6

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

✓ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

CARPRA occurs along transitions to dry meadow;

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR4/3	75	--				SiL	Fibric root mass; wet
4-12	10YR4/1	100	--				L	SATURATED
12-16	10YR5/1	100	--				L	SATURATED
16-32	10YR6/2	100	--				SiCL	SATURATED
32-36+	1PYR6/3	95	7.5YR5/6	5	C	PL/M	C	MOIST, NOT SATURATED

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ________

Depth (inches): ________

Hydric Soil Present? Yes ____ No ✓

Remarks:

Roots in surface horizon impart 7.5yr5/6 colors but are not Fe; No hydric indicators evident. Saturated zone perched on clay at 32 inches. Pores not filled in 32-36; not saturated.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
✓ High Water Table (A2)
✓ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): ____

Water Table Present? Yes ✓ No ____ Depth (inches): 5

Saturation Present? (includes capillary fringe) Yes ✓ No ____ Depth (inches): 0

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

High water table and saturation in response to irrigation; perched water table.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 27, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 3

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): broadly convex Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Greenson loam; Aquic Calciustoll; not hydric; NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No		
Hydrophytic Vegetation Present?		✓	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** ✓
Hydric Soil Present?		✓		
Wetland Hydrology Present?		✓		

Remarks:

Grass hay/pasture; area grazed this year, but normally cut for grass hay; 425750/4621050; area is considerably wetter than typical because of late season irrigation; mesic/alkali meadow veg type;

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 100)			
1. Festuca pratensis	35	Y	FACU
2. Poa pratensis	5	N	FAC
3. Sporobolis airoides	5	N	FAC
4. Hordeum jubatum	5	N	FAC
5. Agrostis stolonifera	5	N	FACW
6. Medicago sativa	1	N	NL
7. AGRREP	5	N	NL
8.			
	61 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	5	x 2 = 10
FAC species	15	x 3 = 45
FACU species	35	x 4 = 140
UPL species	6	x 5 = 30
Column Totals:	61 (A)	225 (B)

Prevalence Index = B/A = 3.7

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ____ **No** ✓

Remarks:

SOIL

Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR4/3	100	--				Loam	Many vf roots
4-8	10YR4/2	100	--				Loam	
8-16+	10YR4/2	100	--				Loam	Strong structure

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ______ No ✓

Remarks:

No hydric indicators present;

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ____________

Water Table Present? Yes ______ No ✓ Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ____________

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 27, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 4

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): broadly concave Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Greenson loam; Aquic Calciustoll; not hydric; NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✓ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	✓	
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓
Is the Sampled Area within a Wetland?		✓

Remarks:

Irrigated throughout growing season; area is considerably wetter than typical because of late season irrigation; irrigated wet meadow vegetation type; 425685/4621060;

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 100m)			
1. Carex nebrascensis	40	Y	OBL
2. Juncus articus	5	N	FACW
3. Hordeum jubatum	5	N	FAC
4. Triglochin maratima	3	N	OBL
5. Phalarus arundinacea	25	Y	FACW
6. Agrostis stolonifera	10	N	FACW
7. Poa pratensis	5	N	FAC
8. Aloprecurus pratensis	5	N	FACW
= Total Cover	98		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	43	x 1 =	43
FACW species	45	x 2 =	90
FAC species	10	x 3 =	30
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	98 (A)		163 (B)

Prevalence Index = B/A = 1.7

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

✓ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR4/3	75	--				SiL	Fibric root mass; wet
4-12	10YR4/1	100	--				L	Saturated;
12-19+	10YR5/1	100	--				L	SATURATED

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No ✓

Remarks:

Roots in surface horizon impart 7.5yr5/6 colors but are not Fe; No hydric indicators evident.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
✓ High Water Table (A2)
✓ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ______ Depth (inches): 1
Water Table Present? Yes ✓ No ______ Depth (inches): 0
Saturation Present? (includes capillary fringe) Yes ✓ No ______ Depth (inches): 0

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

High water table and saturation perched and in response to irrigation;

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 27, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 5

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): broadly convex Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Logan silty clay loam; Typic Calciaquoll; hydric; NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✓ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:

Grass hay/pasture; area historically cut for grass hay; topography subdued; excessively irrigated; 426000/4620975; area is considerably wetter than typical because of late season irrigation; mesic/alkali meadow veg type;

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5. Taraxacum officinale	5		FACU
= Total Cover			
Herb Stratum (Plot size: 100m)			
1. Distichlis spicata	10	Y	FAC
2. Carex praegracilus	10	Y	FACW
3. Festuca pratensis	20	Y	FACU
4. Poa pratensis	5	N	FAC
5. Phleum pratensis	5	N	FACU
6. Sporobalis airodes	5	N	FAC
7. Agropyron repens	10	Y	NL
8. Juncus articus	5	N	FACW
= Total Cover	70		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	15	x 2 = 30
FAC species	20	x 3 = 60
FACU species	25	x 4 = 100
UPL species	10	x 5 = 50
Column Totals:	70 (A)	240 (B)

Prevalence Index = B/A = 3.4

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR4/1	100	--				Loam	many vf roots;
4-8	10YR4/1	100	--				Loam	moist
8-16+	10YR4/1	100	--				Loam	moist to wet

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____

Depth (inches): ____

Hydric Soil Present? Yes ___ No ✓

Remarks:

No hydric indicators present;

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ____

Water Table Present? Yes ___ No ✓ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ____

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 27, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 6

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): broadly concave Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Logan silty clay loam; Typic Calciaquoll; hydric; NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✓ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	✓	
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:

Irrigated throughout growing season; 425850/4621170; irrigated wet meadow; area is considerably wetter than typical because of late season irrigation; irrigated wet meadow;

VEGETATION – Use scientific names of plants.

Stratum / Species	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 100m)			
1. Carex nebraskensis	40	Y	OBL
2. Juncus articus	10	N	FACW
3. Scirpus acutus	3	N	OBL
4. Triglochin maratima	3	N	OBL
5. Phalarus arundinacea	10	N	FACW
6. Agrostis stolonifera	10	N	FACW
7. Eleocharis palustris	20	Y	OBL
8.			
= Total Cover	96		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	66	x 1 =	66
FACW species	30	x 2 =	60
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	96 (A)		126 (B)

Prevalence Index = B/A = 1.3

Hydrophytic Vegetation Indicators:

- ✓ Dominance Test is >50%
- ✓ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR4/3	75	--				SiL	Fibric root mass; saturated; A
4-12	10YR4/1	100	--				L	saturated; AB
12-20	10YR5/1	100	--				L	SATURATED; Bk; calcic;
20-24	10YR6/2	95	7.5YR5/6	5	C	PL/M	C	MOIST (NOT SATURATED)

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ________
Depth (inches): ________

Hydric Soil Present? Yes ____ No ✓

Remarks:

Roots in surface horizon impart 7.5yr5/6 colors but are not Fe; No hydric indicators evident. Saturated layers perched on moist clay layer at 20 inches.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

✓ Surface Water (A1)
✓ High Water Table (A2)
✓ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?	✓		1
Water Table Present?	✓		0
Saturation Present? (includes capillary fringe)	✓		0

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water, high water table and saturation are perched and in response to irrigation;

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 27, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 7

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): broadly convex Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Collett silty clay loam; Aquic Calciustoll; not hydric; NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✓ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:

Grass hay/pasture; area historically cut for grass hay; topography subdued; excessively irrigated; 425750/4621200; area is considerably wetter than typical because of late season irrigation; mesic/alkali meadow veg type;

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2. HERB STRATUM (CONTINUED)			
3. Descurania sophia	2	N	NL
4. Phalaris arundinacea	2	N	FACW
5. Hordeum jubataum	10	Y	FAC
= Total Cover			
Herb Stratum (Plot size: 100m)			
1. Distichlis spicata	5	N	FAC
2. Carex praegracilus	10	Y	FACW
3. Festuca pratensis	15	Y	FACU
4. Poa pratensis	5	N	FAC
5. Phleum pratensis	10	Y	FACU
6. Agrostis stolonifera	15	Y	FACW
7. Agropyron repens	10	Y	NL
8. Juncus articus	5	N	FACW
= Total Cover	89		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	32	x 2 = 64
FAC species	20	x 3 = 60
FACU species	25	x 4 = 100
UPL species	12	x 5 = 60
Column Totals:	89 (A)	284 (B)

Prevalence Index = B/A = 3.2

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: 7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR4/2	100	--				Loam	A1 horizon
4-8	10YR4/2	100	--				Loam	A2 horizon
8-16+	10YR6/2	100	--				Loam	Bk horizon (calcic)

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Stratified Layers (A5) (**LRR C**)
__ 1 cm Muck (A9) (**LRR D**)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1)
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)
__ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

__ 1 cm Muck (A9) (**LRR C**)
__ 2 cm Muck (A10) (**LRR B**)
__ Reduced Vertic (F18)
__ Red Parent Material (TF2)
__ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ________

Depth (inches): ________

Hydric Soil Present? **Yes** ___ **No** ✓

Remarks:

No hydric indicators;

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1) (**Nonriverine**)
__ Sediment Deposits (B2) (**Nonriverine**)
__ Drift Deposits (B3) (**Nonriverine**)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Water-Stained Leaves (B9)
__ Salt Crust (B11)
__ Biotic Crust (B12)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Thin Muck Surface (C7)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water Marks (B1) (**Riverine**)
__ Sediment Deposits (B2) (**Riverine**)
__ Drift Deposits (B3) (**Riverine**)
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Crayfish Burrows (C8)
__ Saturation Visible on Aerial Imagery (C9)
__ Shallow Aquitard (D3)
__ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ____

Water Table Present? Yes ___ No ✓ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ____

Wetland Hydrology Present? **Yes** ___ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 27, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 8

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): broadly concave Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Collett silty clay loam; Aquic Calciustoll; not hydric; NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No ✓ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	✓	
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓
Is the Sampled Area within a Wetland?		✓

Remarks:

Irrigated throughout growing season; 425600/4621200; irrigated wet meadow; area is considerably wetter than typical because of late season irrigation; irrigated wet meadow vegetation type;

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 100m)			
1. Carex nebraskensis	30	Y	OBL
2. Juncus articus	5	N	FACW
3. Eleocharis palustris	10	N	OBL
4. Triglochin maratima	5	N	OBL
5. Phalarus arundinacea	10	N	FACW
6. Agrostis stolonifera	25	Y	FACW
7. Alopecurus pratensis	10	N	FACW
8. Carex rostrata	5	N	OBL
= Total Cover	100		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ___ % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	50	x 1 = 50
FACW species	50	x 2 = 100
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	100 (A)	150 (B)

Prevalence Index = B/A = 1.5

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

✓ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks:

SOIL

Sampling Point: 8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR4/3	75	--				SiL	Fibric root mass; saturated
4-12	10YR4/1	100	--				L	saturated
12-19+	10YR6/1	100	--				L	SATURATED

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No ✓

Remarks:

Roots in surface horizon impart 7.5yr5/6 colors but are not Fe; No hydric indicators evident.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 1

Water Table Present? Yes ✓ No ___ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water, high water table and saturation are a response to irrigation, not groundwater; soils get drier with depth below 24 inches.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 28, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 9

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Airport/Salt Lake complex; Typic Calciaquoll/Natraquoll NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	✓	
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓
Is the Sampled Area within a Wetland?		✓

Remarks:

Flood irrigated; 426060/4621225; area is considerably wetter than typical because of late season irrigation; irrigated wet meadow vegetation type;

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 100 m)			
1. Carex nebrascensis	40	Y	OBL
2. Alopecurus pratensis	10	N	FACW
3. Eleocharis palustris	20	Y	OBL
4. Juncus articus	5	N	FACW
5. Scirpus acutus	5	N	OBL
6. Scirpus pungens	5	N	OBL
7. Hordeum jubatum	5	N	FAC
8.			
= Total Cover	90		
Woody Vine Stratum (Plot size:)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ___ % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	70	x 1 = 70
FACW species	15	x 2 = 30
FAC species	5	x 3 = 15
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	90 (A)	115 (B)

Prevalence Index = B/A = 1.3

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

✓ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks:

SOIL

Sampling Point: 9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR2/1	100	--				SiL	MVF roots; saturated
4-12	10YR2/1	100	--				SiCL	saturated
12-18+	10YR6/1	100	--				SiCL	saturated; Bk (calcic)

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ______ **No** ✓

Remarks:

No hydric features evident;

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ______ Depth (inches): 1

Water Table Present? Yes ✓ No ______ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes ✓ No ______ Depth (inches): 0

Wetland Hydrology Present? **Yes** ______ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water, high water table, and saturation perched and in response to irrigation;

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch   City/County: Logan/Cache   Sampling Date: Oct 28, 2012

Applicant/Owner: Logan City   State: Utah   Sampling Point: 10

Investigator(s): Jensen/Smith   Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace   Local relief (concave, convex, none): broadly convex   Slope (%): <1%

Subregion (LRR): Interior Deserts (B)   Lat: 41.738064   Long: -111.889473   Datum: NAD83

Soil Map Unit Name: Airport/Salt Lake complex; Typic Calciaquoll/Natraquoll   NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed?   Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic?   (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	✓	
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:

Water table may be irrigation induced; 426150/4621200; area is considerably wetter than typical because of late season irrigation; mesic/alkali meadow veg type;

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 100)			
1. Hordeum jubatum	25	Y	FAC
2. Phleum pratensis	1	N	FACU
3. Sisymbrium altissimum	1	N	FACU
4. Rumex crispus	1	N	FAC
5. Melilotus officinalis	1	N	NL
6. Elymus trachycaulus	5	N	FACU
7. Distichlis spicata	25	Y	FAC
8. Agropyton repens	10	N	NL
= Total Cover	69		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____   % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species	51	x 3 = 153
FACU species	7	x 4 = 28
UPL species	11	x 5 = 55
Column Totals:	69 (A)	236 (B)

Prevalence Index = B/A = 3.4

Hydrophytic Vegetation Indicators:

- ✓ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: 10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR3/2	100	--				L	CVF roots; moist;
6-16+	10yr4/1	99	--				CL	3MSBK struct; wet to saturated

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ______ No ______

Remarks:

Bright spots in 6-16 are organic matter; recheck; auger to 4 feet;

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ______	No ✓	Depth (inches): ______
Water Table Present?	Yes ✓	No ______	Depth (inches): 12
Saturation Present? (includes capillary fringe)	Yes ✓	No ______	Depth (inches): 8

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Water table and saturation are perched on clay layer at about 30 inch depth; water is from irrigation, not natural groundwater.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 28, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 11

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): convex Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Airport/Salt Lake complex; Typic Calciaquoll/Natraquoll NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	✓	
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:

Hummock; 426230/4621150; area is considerably wetter than typical because of late season irrigation; mesic/alkali meadow vegetation type;

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 100 m)			
1. Hordeum jubatum	30	Y	FAC
2. Festuca pratensis	10	N	FACU
3. Dischlis spicata	30	Y	FAC
4. Juncus articus	5	N	FACW
5. Elymus trachycaulus	2	N	FACU
6.			
7.			
8.			
= Total Cover	77		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	5	x 2 =	10
FAC species	60	x 3 =	180
FACU species	12	x 4 =	48
UPL species		x 5 =	
Column Totals:	77 (A)		238 (B)

Prevalence Index = B/A = 3.1

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: 11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR3/2	100	--				L	moist; A
8-16+	10YR5/1	100	--				SiCL	wet to saturated; Bk

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No ______

Remarks:

No hydric features;

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
✓ High Water Table (A2)
✓ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ______
Water Table Present? Yes ✓ No ______ Depth (inches): 14
Saturation Present? (includes capillary fringe) Yes ✓ No ______ Depth (inches): 10

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

High water and saturation are in response to irrigation; water is perched on clay layer at about 30 inch depth;

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 29, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 12

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): broadly convex Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Airport/Salt Lake complex; Typic Natraquoll/Calciaquoll; hydric NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ___	**Is the Sampled Area within a Wetland?** **Yes ___ No ✓**
Hydric Soil Present?	Yes ___	No ✓	
Wetland Hydrology Present?	Yes ___	No ✓	

Remarks:

Flood irrigation influencing hydrology and vegetation. 426200/4621000; area is considerably wetter than typical because of late season irrigation; mesic/alkali meadow vegetation type;

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 100 m)			
1. Hordeum jubatum	20	Y	FAC
2. Bromus japonicus	5	N	NL
3. Distichlis spicata	20	Y	FAC
4. Juncus articus	5	N	FACW
5. Agrostis stolonifera	20	Y	FACW
6. Ambrosia artemisiifolia	5	N	FACU
7. Carex praegracilis	15	N	FACW
8.			
= Total Cover	90		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ___ % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	40	x 2 = 80
FAC species	40	x 3 = 120
FACU species	5	x 4 = 20
UPL species	5	x 5 = 25
Column Totals:	90 (A)	245 (B)

Prevalence Index = B/A = 2.7

Hydrophytic Vegetation Indicators:

- ✓ Dominance Test is >50%
- ✓ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ✓ No ___**

Remarks:

SOIL

Sampling Point: 12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR4/3	100	--				L	mvf roots; A1; moist
2-8	10YR4/1	98	--				CL	2msbk; A2; moist;
8-16	10yr5/1	99	--				CL	2mpr; Bn; natric; moist;
16-30	10YR6/1	99	--				CL	2mpr; Bn; natric; moist;
30-42	10YR7/1	100	--				LS	IIC; saturated; perched water;
42-48+	10yr7/2	65	7.5yr5/6	35	C	M	C	IIIC; moist

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No ______

Remarks:

Few very fine spots in 0-30 layers is organic matter, not redox; saturated zone 30-42 is perched on moist clay layer that is strongly mottled; clear indication that water is from surface (irrigation), not groundwater.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ______

Water Table Present? Yes ✓ No ______ Depth (inches): 30

Saturation Present? (includes capillary fringe) Yes ✓ No ✓ Depth (inches): 26

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Perched aquifer in response to irrigation.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 29, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 13

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Airport/Salt Lake complex; Typic Natraquoll/Calciaquoll; hydric NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ✓, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ___	Is the Sampled Area within a Wetland? Yes ___ No ✓
Hydric Soil Present?	Yes ✓	No ___	
Wetland Hydrology Present?	Yes ___	No ✓	

Remarks:

42655/4620975; drained irrigated marsh; historically, the area was flooded by an artesian well east of the parcel;the well was improved recently such that it no longer overflows to this area.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1. HERB STRATUM (CONTINUED)			
2. Ranunculus cymbalaria	5	Y	OBL
3. Cirsium vulgare	1	N	FACU
4. Conyza canadensis	2	N	FACU
5.			
= Total Cover			
Herb Stratum (Plot size: ___)			
1. Hordeum jubatum	5	Y	FAC
2. Scirpus pungens	5	Y	OBL
3. Typha latifolia	5	Y	OBL
4. Rumex crispus	2	N	FAC
5. Cirsium arvense	1	N	FACU
6. Trifolium pratense	5	Y	FACU
7. Distichlis spicata	10	Y	FAC
8. Dipsacus sylvestris	5	Y	NL
= Total Cover	46		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ___ % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 62 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1 =	15
FACW species		x 2 =	
FAC species	17	x 3 =	51
FACU species	9	x 4 =	36
UPL species	5	x 5 =	25
Column Totals:	46 (A)		127 (B)

Prevalence Index = B/A = 2.8

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

✓ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks:

Hydric vegetation is remnant of much wetter conditions that were present as recently as 2009. The area received flow from an artesian well that has since been improved so as not to flow to this area. The area includes sparse cover of OBL, FAC, FACU, and UPL plants. It is a site in transition to drier conditions.

SOIL

Sampling Point: 13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR2/1	100	--				OM	Hemic; moist; O
4-13	10YR2/1	100	--				SiL	Moist; A
13-20	10YR7/2	95	--				SiL	Wet; 5% 10YR2/1; Bk; calcic;
20-32	10YR5/1	100	--				LS	IIC; saturated; perched;
32-40+	10YR6/1	95	7.5YR5/6	5	C	M	C	IIIBk; moist

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ✓ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____

Depth (inches): ____

Hydric Soil Present? Yes ✓ No ____

Remarks:

Hydric soil indicators in surface layers are in response to long term irrigation via an artesian well east of the parcel for about 50 years. Soils are moist to wet to a depth of 20 inches and saturated from 20 to 32 inches. The saturated zone is perched on a moist (not saturated) clay layer that is not glayed and includes secondary carbonates in soft masses and coatings. This indicates the saturated zone is in response to surface water (irrigation), not groundwater. Augered 20-40+;

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): ____

Water Table Present? Yes ✓ No ____ Depth (inches): 24

Saturation Present? (includes capillary fringe) Yes ✓ No ____ Depth (inches): 21

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

High water table, and saturation are perched on clay layer that is not saturated at 32 inches; hydrology indicators are a direct response to irrigation, not groundwater.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 29, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 14

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): broadly convex Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Greenson loam; Aquic Calciustoll; not hydric; NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:

426254/4620900; mesic/alkali meadow vegetation type;

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 100 m)			
1. Hordeum jubatum	15	N	FAC
2. Agrostis stolonifera	10	N	FACW
3. Juncus articus	10	N	FACW
4. Poa pratensis	10	N	FAC
5. Agropyron repens	20	Y	NL
6. Distichlis spicata	25	Y	FAC
7.			
8.			
= Total Cover	90		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	20	x 2 = 40
FAC species	50	x 3 = 150
FACU species		x 4 =
UPL species	20	x 5 = 100
Column Totals:	90 (A)	290 (B)

Prevalence Index = B/A = 3.2

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: 14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR4/3	100	--				L	mvf roots; A1; dry
3-8	10YR3/1	100	--				SiL	slighltly moist; A2;
8-16+	10YR3/1	100	--				SiL	A3; moist;

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No ✓

Remarks:

No hydric indicators;

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ______

Water Table Present? Yes ______ No ✓ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydric indicators;

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 28, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 15

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Greensom loam; somewhat poorly drained; not hydric NWI classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____
Hydric Soil Present?	Yes ✓	No ____
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:

Irrigated marsh vegetation type; 426078/4621090

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 100 m)			
1. Typha latifolia	40	Yes	OBL
2. Scirpus acutus	40	Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	80		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	80	x 1 = 80
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	80 (A)	80 (B)

Prevalence Index = B/A = 1

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

✓ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

Open water 10 percent;

SOIL

Sampling Point: 15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR3/1	100	--				L	saturated;
16-32	10YR4/1	100	--				SiCL	wet to saturated; dryer deep;
32-48+	2.5Y6/1	97	7.5YR5/6	3	C	PL/M	CL	wet to moist; dryer with depth;

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ✓ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ✓ No ___

Remarks:

Assumed OM in parts of 0-16 layer > 8 percent and within definition of mucky.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 2

Water Table Present? Yes ✓ No ___ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water, high water table, and saturation are perched on impermeable, moist (not saturated) clay layer at about 32 inch depth; water is surface water from irrigation.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Logan River Ranch City/County: Logan/Cache Sampling Date: Oct 28, 2012

Applicant/Owner: Logan City State: Utah Sampling Point: 16

Investigator(s): Jensen/Smith Section, Township, Range: S31, T14N, R5E

Landform (hillslope, terrace, etc.): Low lake terrace Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR): Interior Deserts (B) Lat: 41.738064 Long: -111.889473 Datum: NAD83

Soil Map Unit Name: Greensom loam; somewhat poorly drained; not hydric NWI classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	Is the Sampled Area within a Wetland? Yes ____ No ✓
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks:

Irrigated marsh vegetation type; 426123/4620894

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 100 m)			
1. Typha latifolia	85	Yes	OBL
2. Polypogon monspeliensis	5	no	FACW
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	80		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	85	x 1 =	85
FACW species	5	x 2 =	10
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	90 (A)		95 (B)

Prevalence Index = B/A = 1.1

Hydrophytic Vegetation Indicators:

- ✓ Dominance Test is >50%
- ✓ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

Open water 10 percent;

SOIL

Sampling Point: 16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR3/1	100	--				SiCL	saturated; A1
12-30	10YR2/1	100	--				SiCL	sat; dryer deep; mucky layers; A2
30-40+	2.5Y6/1	97	7.5YR5/6	3	C	PL/M	CL	wet -> moist; dryer w/ depth;Bkg

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ✓ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ______

Remarks:

Assumed OM in parts of 0-12 layer > 8 percent and within definition of mucky.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ______ Depth (inches): 2

Water Table Present? Yes ✓ No ______ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes ✓ No ______ Depth (inches): 0

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water, high water table, and saturation are perched on impermeable, moist (not saturated) clay layer at about 30 inch depth; water is surface water from irrigation.

APPENDIX B
PHOTOGRAPHS

Photopoint 1, NE.

Photopoint 2, E.

Photopoint 2, N.

Photopoint 2, S.

Photopoint 2, W.

Photopoint 3, NW.

Photopoint 4, NW.

Photopoint 5, S.

Photopoint 6, S.

Photopoint 7, N.

Photopoint 7, S.

Photopoint 8, N.

Photopoint 9, S.

Photopoint 10, N.

Photopoint 11, N.

Photopoint 12, N.

Photopoint 12, WNW.

Photopoint 13, N.

Photopoint 13, S.

Photopoint 14, S.

Photopoint 15, W.

Photopoint 16,

Photopoint 17, E.

Photopoint 17, N

Photopoint 17, W.

Photopoint 18, SW.

Photopoint 20, N.

Photopoint 21, S.

Photopoint 22, S

Photopoint 23, N.

Photopoint 24, ESE.

Photopoint 24, N.

Photopoint 24, WNW.

Photopoint 25, E.

Photopoint 25, N.

Photopoint 25, S.

Photopoint 25, W.

Photopoint 26, N.

Photopoint 27, E.

Photopoint 28, N.

Photopoint 30, S.

Photopoint 31, S.

Photopoint 32, S.

Photopoint 33, S.

Photopoint 34, SSE.

Photopoint 35, N.

APPENDIX C

PLANT SPECIES LIST

Table C-1. Plant species list.			
Acronym	**Species**	**Status**	**Common Name**
Grass-Like Plants			
AGRREP	*Agropyron repens*	NL	quackgrass
AGRSTO	*Agrostis stolonifera*	FACW	spreading bentgrass
AGRTRA	*Agropyron trachycaulum*	NL	slender wheatgrass
ALOPRA	*Alopecurus pratensis*	FACW	field meadow-foxtail
BECSYZ	*Beckmannia syzigachne*	OBL	American slough grass
BROTEC	*Bromus tectorum*	NL	cheatgrass
CARNEB	*Carex nebrascensis*	OBL	Nebraska sedge
CARPRA	*Carex praegracilis*	FACW	clustered field sedge
DISSPI	*Distichlis spicata*	FAC	saltgrass
ELEPAL	*Eleocharis palustris*	OBL	common spikerush
ELEROS	*Eleocharis rostellata*	OBL	beaked spike-rush
ELYTRA	*Elymus trachycaulus*	FACU	slender wild rye
FESPRA	*Festuca pratensis*	FACU	meadow fescue
HORJUB	*Hordeum jubatum*	FAC	foxtail barley
JUNART	*Juncus arcticus*	FACW	Arctic rush
JUNTOR	*Juncus torreyi*	FACW	Torry's rush
PHAARU	*Phalaris arundinacea*	FACW	reed canary grass
PHLPRA	*Phleum pratense*	FACU	common timothy
POAPRA	*Poa pratensis*	FAC	Kentucky bluegrass
POLMON	*Polypogon monspeliensis*	FACW	rabbit-foot grass
SPAGRA	*Spartina gracilis*	FACW	alkali cord grass
SPOAIR	*Sporobolis airoides*	FAC	alkali sakaton
Forbs			
AMBART	*Ambrosia artemisiifolia*	FACU	annual ragweed
ASCSPE	*Asclepias speciosa*	FAC	showy milkweed
CARDRA	*Cardaria draba*	NL	whitetop
CIRARV	*Cirsium arvense*	FACU	Canadian thistle
CIRVUL	*Cirsium vulgare*	FACU	bull thistle
CONARV	*Convolvulus arvensis*	UPL	bindweed
CONCAN	*Conyza canadensis*	FACU	Canadian horseweed
CONMAC	*Conium maculatum*	FACW	poison hemlock
DESSOP	*Descurania sophia*	NL	mustard
DIPSYL	*Dipsacus sylvestris*	NL	teasle
EQUHYM	*Equisetum hyemale*	FACW	tall scouring rush
GALOFF	*Galega officinalis*	NL	goatsrue
GRISQU	*Grindelia squarrosa*	FACU	curly-cup gumweed
HELANN	*Helianthus annuus*	FACU	common sunflower

Table C-1. Plant species list.			
Acronym	**Species**	**Status**	**Common Name**
Forbs (continued)			
IVAXAN	*Iva xanthifolia*	NL	giant sumpweed
LACSER	*Lactuca serriola*	FACU	pricly lettuce
MEDMER	*Medicago meyeri*	NL	bur medick
MEDSAT	*Medicago sativa*	NL	alfalfa
MELALB	*Melilotus alba*	NL	white sweetclover
MELOFF	*Melilotus officinalis*	FACU	yellow sweetclover
MENARV	*Mentha arvensis*	FACW	American wild mint
ONOACA	*Onopordum acanthium*	NL	Scotch thistle
RANCYM	*Ranunculus cymbalaria*	OBL	alkali buttercup
RUMCRI	*Rumex crispus*	FAC	curly dock
SCIACU	*Scirpus acutus*	OBL	hardstem bulrush
SCIPUN	*Scirpus pungens*	OBL	common threesquare
SISALT	*Sisymbrium altissimum*	FACU	tall hedge mustard
SONARV	*Sonchus arvensis*	FACU	field sow-thistle
TAROFF	*Taraxacum officinale*	FACU	dandelion
TRIMAR	*Triglochin maritima*	OBL	seaside arrowgrass
TRIPRA	*Trifolium pratense*	FACU	red clover
TYPLAT	*Typha latifolia*	OBL	cattail
XANSTR	*Xanthium strumarium*	FAC	rough cockleburr
Shrubs			
ATRGAR	Atriplex gardneri	NL	Gardner saltbush
Trees			
SALFRA	*Salix fragilis*	FAC	crack willow
ELAANG	*Elaeagnus angustifolia*	FAC	Russian olive

APPENDIX D

USACE IRRIGATED WETLANDS MEMO

CESPK-CO-R(1145) 1 Oct 2003

REGULATORY BRANCH MEMORANDUM 2003-04

SUBJECT: "Irrigated" Wetlands

1. Purpose. To establish policy regarding wetlands in irrigated areas.

2. Applicability. This applies to wetlands subject to jurisdiction under Section 404 of the Clean Water Act in the Sacramento District.

3. References.

a. Section 404 of the Clean Water Act, 33 USC 1344.

b. 33 CFR Parts 320-331, Regulatory Programs of the Corps of Engineers, November 13,1986.

c. 33 CFR 328.3, preamble and definition of "waters of the United States", November 13,1986.

d. Corps of Engineers Wetland Delineation Manual, January 1987.

4. Background. In accordance with reference 3(c) above, any area exhibiting wetland characteristics sustained solely by the application of irrigation water is not regulated under Section 404 of the Clean Water Act. Experience has shown that certain circumstances raise substantial questions. Specifically, hydrophytic vegetation can be established and maintained solely by irrigation practices. Also, hydric soils usually develop over a long period of time, and can exhibit hydric soil indicators even if the hydrology has been removed by such activities as dams, diversions, ditches, and other modifications. Therefore, difficulty arises when an area has hydrophytic vegetation and hydric soils, and the landowner claims that his land is wet only because he irrigates it. Such a claim may be (1) completely correct, in that the property would be dry without irrigation; (2) partially correct, in that a portion would be dry while the remainder would be wet with or without irrigation; or (3) incorrect, in that the area would be wet without irrigation, although irrigation may enhance the

growth of hydrophytic vegetation and the duration of water inundation or saturation. The only sure way to prove whether irrigation is sustaining a wet area is to discontinue the use of irrigation water and evaluate the results. This will normally require the cessation of irrigation for two or more growing seasons. Several years may be necessary under drought conditions.

Discontinuing the use of irrigation for this length of time is the best approach to determining whether an area should be regulated under Section 404. Since this approach may not always be practical in all cases, it is necessary to establish an alternate procedure for making jurisdictional determinations regarding irrigated wetlands.

5. Procedure. The following alternate approach will be followed for irrigated wetlands when the cessation of irrigation is not practical:

a. Obtain information from the Natural Resource Conservation Service Soil Survey for the subject area (if available). The soil survey will usually provide groundwater table and flooding information, as well as the type of vegetation found in particular soil types. Once the soil series is identified, determine whether the soil is listed as a hydric soil, or a soil with hydric inclusions, on the local and national hydric soils lists.

b. Check with Federal, State, and local agencies to determine if any surface or groundwater records are available for the property.

c. Obtain information from the landowner, his neighbors, or others who may have knowledge of the hydrologic characteristics of the property.

d. Conduct an on-site wetland delineation of the property.

e. Review period of record and determine whether drought conditions exist.

f. Review available aerial photography to characterize historical conditions of the site and past irrigation practices.

6. Policy. One of the following findings will be made upon completion of the procedure established in paragraph 5 above.

a. The area is not a jurisdictional wetland because (1) there were no positive indicators for vegetation and/or soils; or (2) it was obvious that the area would be dry without irrigation based on information obtained and/or field observations.

b. The area is a jurisdictional wetland because there were positive indicators for all three parameters. This finding will clearly identify the source of non-irrigation water (i.e. springs, surface flooding, groundwater, drainage patterns, etc.)

c. There are positive soils and vegetation indicators but the relative importance of irrigation vs. natural hydrology/groundwater in maintaining the wetland cannot be determined. In this case, the area will be regulated under Section 404, unless convincing information is provided that the area is wet due solely to irrigation.

for ANDREW J. ROSENAU
Chief, Regulatory Branch

APPENDIX D

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Phase I ESA
Proposed Waste Water Treatment Facility
2300 West Highway 30
Logan, Utah

IGES Job No. 00823-011

September 28, 2012

Prepared for:

Carollo Engineers, Inc.
c/o Craig Ashcroft, P.E.

TABLE OF CONTENTS

APPENDIX

Plates

1.0 INTRODUCTION

This report presents the results of Intermountain GeoEnvironmental Services, Inc. (IGES) Phase I Environmental Site Assessment (Phase I ESA) of the approximately 130-acre site for Logan City's proposed waste water treatment facility at approximately 2300 West on Highway 30 (200 North) in Logan, Utah. The subject site is predominantly vacant and undeveloped with several structures currently on site that are associated with agriculture and animal corrals. A significant portion of the subject site is considered wetlands. In general, the subject property is surrounded in a ¼ mile radius by other land used for similar purposes and water treatment ponds located north of and adjacent to the site. A wetland delineation assessment is not included in the scope of work for this Phase I ESA.

2.0 PURPOSE AND SCOPE

The purpose of this Phase I ESA is to observe and assess, on the basis of readily available information, recognized environmental conditions associated with the present and historical uses of the property and neighboring properties and facilities in the site vicinity (within an approximate ¼-mile radius of the site). A recognized environmental condition is defined by ASTM E 1527-05 as "…the presence or likely presence of any *hazardous substances* or *petroleum products* on a *property* under conditions that indicate an existing release, a past release, or a *material threat* of a release of any *hazardous substances* or *petroleum products* into structures on the *property* or into the ground, ground water, or surface water of the *property*. The term includes *hazardous substances* or *petroleum products* even under conditions in compliance with laws. The term is not intended to include *de minimis* conditions that generally do not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies. Conditions determined to be *de minimis* are not *recognized environmental conditions*."

This Phase I ESA was performed in general accordance with the standards set forth in ASTM Document E 1527-05, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process. The United States Environmental Protection Agency's (EPA) All Appropriate Inquiries (AAI) rule recognizes ASTM E 1527-05 as "*at least as stringent*" and can be used to guide environmental professionals (EP) in satisfying the requirements of AAI. The *user* is defined by ASTM E 1527-05 as "-the party seeking to use this practice to complete an environmental site assessment of the property." AAI describes the *user* as a person or party that is seeking Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) liability protection. The user may include any one of the following: owner or potential owner of the property, tenant or potential tenant of the property, financial lender, property manager, etc.

Under ASTM E 1527-05 and AAI it is understood that the user's responsibilities include the following:

- Search for environmental liens on the property.
- Consider actual or specialized knowledge of the subject property and adjoining properties.
- Consider the relationship of the purchase price to the value of the property if not contaminated.
- Take into consideration known or reasonably ascertainable information regarding the property.
- Provide tract maps if available.

Under ASTM E 1527-05 and AAI it is understood that the EP's responsibilities are to complete the following:

- An environmental inquiry.
- Review historical sources of the property which include existing topographic maps, aerial photographs of the property and previous ESAs.
- Visual inspection of the subject property and adjoining properties or specific areas of the subject property and adjoining properties based on review of available historical sources.
- Interviews with current and past owners, operators, and occupants of the subject property.
- Reviews of federal and state environmental agency databases.

Under ASTM E 1527-05 and AAI it is understood that the following responsibilities are shared by the user and the EP:

- Consider commonly known information about the property.
- Consider the degree of obviousness of contamination.

Specific tasks completed by the EP and the user include the following:

- Consider specialized knowledge and information at the subject property.
- Consider degree of obviousness of contamination at the subject property.

Specific tasks completed by the EP include the following:

- Review and interpretation of available historical aerial photographs showing developments on the subject property and surrounding property since 1953.
- Reconnaissance of the site and area within a ¼-mile radius of the site to make visual observations of surface drainage conditions, water wells, areas of visual contamination and surrounding land use.
- Contact Environmental Data Resources, Inc. (EDR) to search Federal and State environmental database lists within the radial limits as set-forth in ASTM E 1527-05.
  - Additionally, IGES requested EDR to provide a Certified Sanborn® Map Report and aerial photographs which are included in The EDR Aerial Photo Decade Package report; both EDR reports are attached to this report.
- Interviews with current property owners and other government entities as appropriate for an assessment of potential historic recognized environmental conditions associated with the subject property, site vicinity and their respective uses.
- Preparation of this summary report with IGES's findings and recommendations.

This scope of work does not include a wetlands delineation, however, it is our understanding that a wetlands delineation has been recently completed or will be completed by others. The scope of work does not include an assessment of endangered species, asbestos, regulatory compliance, radon, mold, water quality or cultural and historic resources.

Mr. David A. Petersen (IGES) completed the site reconnaissance of the subject property and surrounding properties as well as the aerial photography review, interviews and preparation of this report. Review of the report was completed by Mr. Brett D. Mickelson (IGES).

3.0 SITE DESCRIPTION

3.1 PHYSIOGRAPHY

The majority of the subject property is located in the southern half of the northwestern quarter of Section 31, Township 14 North, Range 1 East and a smaller portion is located in the southeastern portion of the northeast quarter of Section 36, Township 14 North Range 1 West of the Salt Lake Base and Meridian. Topographic map coverage of the site vicinity is provided by the U.S. Geological Survey (USGS), Logan and Wellsville, Utah 7.5 Minute Quadrangles. Based on these topographic maps the subject property is relatively flat. The approximate location of the subject property and surrounding area is shown on the Site Vicinity Map (Plate 1); the general layout of the property is shown on the Site Map (Plate 2).

3.2 GEOLOGIC SETTING

The site is located in Logan, Utah at an elevation of approximately 4,430 feet above sea level in the south central portion of the Cache Valley. Cache Valley is a major intermountain basin located east of the Wasatch fault zone and is flanked on the west by the Wellsville Mountains and on the east by the Bear River Range. This valley represents a deep, sediment-filled structural basin of Cenozoic age located east of the Wasatch fault zone and flanked by uplifted blocks, the Wellsville Mountains on the west, and the Bear River Range on the east (Dover, 1995; Hintze, 1980). Because Cache Valley has active normal faults both on its western and eastern boundaries (McCalpin, 1994), it appears to be the easternmost expression of pronounced Basin and Range extension in northern Utah.

The near-surface geology of the Cache Valley is dominated by sediments, which were deposited within the last 30,000 years by Lake Bonneville (Scott and others, 1983; Hintze, 1993; McCalpin, 1994; Dover, 1995). The lacustrine sediments near the mountain front consist mostly of gravel and sand. As the lake receded, streams began to incise large deltas formed at the mouths of major canyons along the Wellsville Mountains and the Bear River Range, and the eroded material was deposited in shallow lakes and marshes in the basin and in a series of recessional deltas and alluvial fans. Sediments toward the center of the valley are predominately deep-water deposits of clay, silt and fine sand. However, these deep-water deposits are in places covered by a thin post-Bonneville alluvial cover. Most surficial deposits in the Cache Valley were deposited during the Bonneville Lake Cycle that was the last cycle of Lake Bonneville between approximately 32 to 10 ka (thousands of years ago) and in the Holocene (< 10 ka).

3.3 FAULTING

There are no known active faults that pass under or immediately adjacent to the site (McCalpin, 1989, Hecker, 1993). The site is located approximately 4.7 miles west of the mapped location of the Central segment of the East Cache fault zone (McCalpin, 1989). The East Cache fault zone is approximately 48 miles long and forms the boundary between Cache Valley and the Bear River Range. The central segment is one of three main sections of the East Cache fault zone and is approximately 9.6 miles long and extends from Green Canyon southward to Blacksmith Fork Canyon. The site is also located approximately 4.1 miles east of the West Cache fault zone. The most recent surface faulting event along the West Cache fault zone occurred on the Clarkston fault approximately 3,600 to 4,000 years ago (Black and others, 2000).

3.4 HYDROLOGY/HYDROGEOLOGY

As mentioned previously, a significant portion of the subject site appears to be wetland area. Based on the United States Fish & Wildlife Service National Wetland Inventory (http://www.fws.gov/wetlands/Data/Mapper.html) a significant portion of the eastern half of the subject property is mapped as *Freshwater Emergent* with other smaller portions, including on the west half of the subject property, being mapped as *Freshwater Emergent* as well. A freshwater pond is also mapped east of the subject property with what appears to be a manmade canal extending northwest and then west through the subject property. Numerous other drainages, ditches, wetlands and springs are mapped in the general vicinity. The Logan River is mapped within approximately ½-mile of the subject property. No explorations were completed at the site by IGES, however, due to the presence of several wetlands, Logan river and the pond, it is our opinion that groundwater is relatively shallow. Based on our review of documents available at Logan City Department of Environmental Quality and as summarized in Section 10.0, the groundwater gradient is reported to be towards the southwest.

4.0 USER PROVIDED INFORMATION

At the time this report was prepared the user had not completed the provided user questionnaire. Further information regarding the user questionnaire is provided in Section 11.0 of this report.

5.0 SITE RECONNAISSANCE

On September 12, 2012, an experienced geotechnical engineer completed a site reconnaissance of the site; photos taken at that time are included as Plates 3 - 18. At the time of our site reconnaissance the site was largely vacant and undeveloped with only minor structures associated with farming and livestock grazing activities observed on the subject property. The property is relatively flat, and as described previously (Section 3.4), includes a significant portion that is mapped as *Freshwater Emergent* wetlands (http://www.fws.gov/wetlands/Data/Mapper.html). The areas mapped as wetlands include a significant portion of the eastern half of the subject property as well as other smaller portions, including on the west half of the subject property. These areas were observed to have some hydrophilic plants and some of these areas were observed to have several inches of standing water; however, as indicated by the property owner, the site is flood irrigated and it was unclear as to whether this water was a result of flood irrigation or shallow groundwater. The majority of the ground appeared to be covered with grass and various weeds; an unpaved road runs north-south through the center of the subject property. A metal pipe culvert is located beneath the unpaved road at the location of the canal.

Several fenced in areas were observed in the south central portion of the subject property that appeared to have been used as an animal corral with feeding troughs. IGES observed two open structures located north of the southern animal corrals; it appeared that these structures provided some shelter from the weather to animals. A pile of accumulated manure and hay was located in the southern animal corral. Various materials were stored outside of these structures and included wood, brick, metal and wire, as well as some rusty decrepit farming tools and other miscellaneous items and garbage which included plastic, metal and wood.

An animal corral and feeding troughs are also located in the north central portion of the subject property. An old wooden dilapidated house, a wooden storage unit and structures used to provide some shelter to animals are also located in the north central portion of the subject property. Wired string with a mild electric current running through it is used throughout the property to help keep animals in a desired section of the property.

Numerous automobile rubber tires were located on the subject property; some located in random locations while the majority was being used to hold down plastic tarps on top of hay. Overhead power is provided to the site adjacent to the unpaved road and appears to be used for overhead lighting and in some of the storage and animal covering areas.

As mentioned previously, a canal extends through the property from east to west and appears to be manmade; it appears that the source of the canal is at the western end of a natural pond located east of the subject property. The canal extends from the eastern boundary to the western boundary of the subject property and approximately divides the property into northern and southern halves. Several ditches that are oriented perpendicular to the canal are also observed in the northern and southern halves of the subject property; some, but not all of these ditches were filled with water at the time of our site reconnaissance. A ditch was also located on the subject property parallel to the southern boundary near Highway 30 (200 North). Numerous frogs were observed along the banks of the canal on the subject property (Plate 10). The canal has been fitted with gates and other diversion devices to help divert water into various ditches and areas. Soil spoils were observed adjacent to the canal in numerous locations; it appears that they have come from the canal channel.

Irish black cattle were observed grazing in the north western portion of the subject property. What appeared to be a linear pond, or historic canal was located in this area as well. No areas of stressed vegetation were observed.

IGES completed a search for water rights on the subject property at the Utah Division of Water Rights website http://nrwrt1.nr.state.ut.us/wrinfo/query.asp. Three water rights were observed on the subject property each of them are in the name of and/or owned by Eliason Packing Company and are reportedly underground water claims used for stock watering of cattle of other animals. Additionally, the EDR report (EDR, 2012) has listed a fourth water right on the property that is in the name of the United States Geological Survey (USGS). Information for each of these water rights is included in the EDR report in the geocheck section (EDR, 2012). Additionally, two concrete watering basins and at least four to five rubber-tire enclosed watering basins were observed on the subject property. As described in Section 9.2, the property owner indicated that these watering basins are enclosing artesian wells. It appeared that these enclosures include a drain pipe which is used to drain water once it reaches a certain elevation, but it was unclear where the water drained.

6.0 SURROUNDING LAND USE

An experienced geotechnical engineer from IGES performed a reconnaissance of the general site vicinity within an approximate ¼-mile radius of the subject property to observe types of land use within the search area. The subject property is surrounded by other properties with similar uses, however, the majority of the neighboring properties have various different uses. The property located north of and adjacent to the subject property is used by Logan City for the treatment of sewage. Property located east of and adjacent to the subject property is vacant and what appears to be a natural pond is also located east of the subject property. The subject property is bound on the south by Highway 30 (200 North) and much of the property located south of Highway 30 is also vacant, undeveloped and unused. However, a humane society for domestic animals, an auto salvage yard, a property used to store recreation vehicles and boats, a farm property that appears to be storing hay and a rural residential property are also located on the south side of Highway 30 within a ¼-mile of the subject property.

The property is bordered on the west by an older shooting range used for target practice and a property which is used to treat outfall from the sewage ponds. There is a newer public shooting range located west of the area used to treat sewage pond outfall which is located west of the older shooting range. Logan City Landfill is located approximately ¼ of a mile southeast of the subject property. Due to the proximity of the landfill and shallow groundwater, IGES reviewed groundwater sampling and testing reports at the landfill; a summary of our review is included in Section 10.0.

IGES observed portions of the adjacent properties and noted no readily observable environmental concerns.

7.0 PAST SITE LAND USE

7.1 SITE HISTORY

IGES has reviewed and interpreted readily available historical aerial photographs for the site and the immediate site vicinity to observe surface conditions and activities. Aerial photographs obtained from Olympus Aerial Surveys, Inc., EDR and the Automated Geographic Reference Center (AGRC) were reviewed for the years: 1953, 1976, 1981, 1987, 1988, 1993, 1994, 1997, 2001, 2005 and 2011. Based on our aerial photography research, the subject property and surrounding areas are largely used as farming or rangeland. Aerial photographs are included for the years 1953, 1976, 1981, 1987, 1988, 1993, 1997 & 2011 in the *The EDR Aerial Photo Decade Package*, and on Plates 19 and 20.

7.2 AERIAL PHOTOGRAPHS

June 9, 1953

The eastern portion of the subject property appears to be wetland or wetland-like area as evidenced by standing water. Highway 30 (200 North) is observed south of and adjacent to the subject property. The property located south of Highway 30 appears to be property with similar uses as the subject property itself and is largely undeveloped. The subject property is bordered on the east by undeveloped property that appears to be largely similar in nature to that of the subject property; this property includes a pond that appears to be natural and wetland or wetland-like area. What appears to be a manmade canal is observed to extend diagonally northwest out of the pond located east of the subject property. This canal then turns to be oriented east-west and runs through the subject property essentially dividing it into northern and southern halves.

What appears to be a natural drainage, or natural depression is oriented south to north through the center of the subject property. What appears to be a pond or natural depression in an area of shallow ground water is located near the northern boundary in the northwest portion of the subject property.

An unpaved roadway at approximately 2300 West is located immediately west of this drainage, or natural depression, and extends from Highway 30 north to the northern boundary of the subject property and potentially beyond. The canal described previously extends west past the unpaved roadway and includes a small branch that is oriented approximately southeast to northwest and appears to end near the pond or natural depression in the northwest portion of the subject property. The unpaved road bridges over the canal and several other structures are located on the west side of the road and east of the branch of the canal.

A single structure appears to be located southeast of where the unpaved road crosses over the canal. Several other structures are located in the northwest portion of the subject property between the northwest-southeast branch of the canal and the unpaved road. Additionally, a structure is located where the old dilapidated wood home was observed at the time of our site reconnaissance. What appears to be a smaller ditch, branches off of the canal near the eastern portion of the subject property where the canal turns to be oriented east-west. The ditch is oriented southeast to northwest until it is close to the northern boundary of the subject property, there it curves west, and then southwest until it reaches the manmade canal and natural drainage/depression. It appears that some areas in the western portion of the subject property may have been used or are being used for agriculture.

August 25, 1976

Seven ponds that appear to be used in conjunction with water treatments are observed north of and adjacent to the subject property. Structures and development that appear to be part of the water treatment ponds are located west of and adjacent to the subject property. An area of soil disturbance is observed adjacent to the southern boundary of the subject property northeast of the intersection of the unpaved road and Highway 30. No other significant changes were observed since the previous photograph; the quality of this aerial photograph is lower than the previous photograph and some details are less clear.

September 1, 1981

What appears to be animal corrals, are located east of the unpaved roadway and south of the manmade canal where they are currently located as well as in the northern portion of the subject property near the northern boundary and west of the unpaved road close to the dilapidated house.

July 24, 1987

Evidence is seen that sections of the western half of the property are being farmed or plowed. It appears that two storage structures are located immediately north of the animal corrals located in the southern portion of the subject property on the east side of the unpaved road. The natural drainage/depression appears to be wider immediately north and east of the canal and unpaved road respectively. What appear to be less pronounced unpaved roads are observed on the subject property and are in general adjacent to the canal.

June 30, 1988; August 14, 1993; May 24, 1994; October 4, 1997; April 22, 1998; May 24, 2001, July 12, 2005 and August 10, 2011

No significant changes were observed on the subject property or surrounding properties since the previous photograph(s).

8.0 FEDERAL AND STATE AGENCY DOCUMENT REVIEW

IGES staff reviewed the results of the database search of regulatory agencies records to assess the subject property regarding potential environmental conditions. The purpose of the review is to assess whether the subject property, adjacent properties, or other properties within the vicinity have been identified as having environmental problems that might impact the property. Our regulatory review utilized the services of EDR, a firm that specializes in searching databases of Federal and state hazardous waste sites and other related information. A complete list and description of the Federal and state databases are included in the EDR Radius Map Report (EDR, 2012) and is presented in the Appendix. Findings from the databases searched by EDR are contained in the following tables and discussed in the following paragraphs.

8.1 FEDERAL AGENCY DOCUMENT REVIEW

Database Searched	Search Distance (miles)	Total Plotted by EDR
NPL	1	0
Proposed NPL	1	0
Delisted NPL	1	0
NPL Liens	TP	0
CERCLIS	½	0
FEDERAL FACILITY	1	0
CERC-NFRAP	½	0
LIENS2*	TP	0
CORRACTS	1	0
RCRA TSDF	½	0
RCRA Lg. Quan. Gen.	¼	0
RCRA Sm. Quan. Gen.	¼	0
RCRA Conditionally Exempt Sm. Quan. Gen.	¼	0
RCRA Non Generators*	¼	0
ERNS	TP	0
HMIRS*	TP	0
US ENG CONTROLS	½	0
US INST CONTROL	½	0
DOT OPS*	TP	0
US CDL*	TP	0
CDL*	TP	0

Database Searched	Search Distance (miles)	Total Plotted by EDR
FUDS*	1	0
US BROWNFIELDS*	½	0
DOD*	1	0
CONSENT*	1	0
ROD*	1	0
UMTRA*	½	0
ODI*	½	0
DEBRIS REGION 9*	½	0
TRIS*	TP	0
TSCA*	TP	0
FTTS*	TP	0
HIST FTTS*	TP	0
SSTS*	TP	0
ICIS*	TP	0
RADINFO*	TP	0
LUCIS*	½	0
PADS*	TP	0
MLTS*	TP	0
MINES*	¼	0
FINDS*	TP	0
RAATS*	TP	0
FINANCIAL ASSURANCE	TP	0

TP denotes Target Property

* Indicates that these databases have been searched in addition to the standard databases

EDR identified no sites in the federal databases listed above.

8.2 STATE AGENCY DOCUMENT REVIEW

Database Searched	Search Distance (miles)	Total Plotted by EDR
SWF/LF	½	0
LUST	½	0
UST	¼	0
LAST	½	0
AST	¼	0
FEMA UST	¼	0
SPILLS*	TP	0
INST CONTROL	½	0
VCP	½	0
DRYCLEANERS*	¼	0
SCRD DRYCLEANERS*	½	0
BROWNFIELDS	½	0
NPDES*	TP	0
PCB TRANSFORMER	TP	0

TP denotes Target Property
* Indicates that these databases have been searched in addition to the standard databases

EDR identified no sites in the state databases listed above. As is noted above, the search radius for solid waste facilities and landfill sites (SWF/LF) indicates that no facilities were located within a ½-mile radius of the subject property. However, the Logan City Landfill is located at a distance of approximately ¼ to ¾ of a mile away from the subject property. Based on this information, IGES has reviewed groundwater monitoring reports and other documentation for the landfill; a summary of our review is included in Section 10.0.

8.3 TRIBAL RECORDS DOCUMENT REVIEW

Database Searched	Search Distance (miles)	Total Plotted
INDIAN VCP	½	0
INDIAN LUST	½	0
INDIAN UST	¼	0
INDIAN RESERV*	1	0

* Indicates that these databases have been searched in addition to the standard databases

No additional tribal records were researched due to the fact that the subject property is not on or adjacent to tribal property.

8.4 PROPRIETARY RECORDS DOCUMENT REVIEW

Database Searched	Search Distance (miles)	Total Plotted
MANUFACTURED GAS PLANTS	1	0
EDR Historical Auto Stations	¼	0
EDR Historical Cleaners	¼	0

8.5 AREA RADON INFORMATION REVIEW

Our review of the United States Environmental Protection Agency's (USEPA) National Radon Database (http://www.epa.gov/radon/states/utah.html) it appears that the federal EPA radon zone for the subject site is 2. A radon zone of 2 indicates that indoor areas have a moderate potential for elevated radon levels, with a predicted average indoor radon screening level of between 2 to 4 pCi/L (Picocuries/Liter). Radon is a colorless, odorless, tasteless, chemically inert, and naturally occurring radioactive gas. Thorium and uranium are two sources of radon commonly found in soil and rock. Radioactive decay of these elements produces the radioactive gas radon. Radon accumulates in basements and other low levels in homes and other structures.

8.6 ORPHAN SUMMARY

EDR's review identified 20 sites that were not mapped due to inaccurate or incomplete addresses, or due to the site location being restricted. IGES' review indicates that all of these sites appear to be located outside of ASTM's recommended search radii.

9.0 AGENCY/PREVIOUS OWNER CONTACTS

IGES conducted telephone inquiries of city offices and current land users for information regarding hazardous waste/material spills or other incidents within or near the site vicinity which may have potentially impacted the soils and/or groundwater, and which may present a potential environmental impairment to the subject property.

9.1 CURRENT LAND OWNER – ELIASON PACKAGING COMPANY

IGES interviewed Jeff Eliason of Eliason Packaging Company, the current owner of the subject property. Mr. Eliason indicated that Eliason Packaging Company has owned the property since the 1940s or earlier with ownership being held by family members. He indicated that it has always been used for growing hay and grazing cattle. He indicated that the eastern portion of the property has typically been used for grazing cattle and the western portion has been used for growing hay. He indicated that the old house in the north central portion of the subject property has typically been used for storage. He indicated that the property has been flood irrigated with water from the Logan Canal Company and that several artesian wells exist on the property. Mr. Eliason indicated that fuel was never stored on property. He also indicated that nothing was buried on the property.

9.2 FIRE DEPARTMENT

IGES contacted the Logan City Fire Department to inquire regarding any available records of hazmat calls. Logan City Fire Department reported that they have no records of hazmat calls at the subject property.

9.3 LOGAN CITY ENVIRONMENTAL DEPARTMENT

IGES completed limited inquiries with Carl Francis, Landfill Manager for the Logan City Landfill. Mr. Francis indicated that the Logan City Landfill is participating in a voluntary corrective action program, as indicated in Section 10.0. He indicated that an offsite collection system is used to collect leachate that has come from the landfill. The leachate is pumped into a lined pond where it is allowed to evaporate. After a period of time, the leachate is pumped into two un-lined evaporative ponds.

10.0 DOCUMENT REVIEW

As mentioned previously, an IGES employee reviewed documents available for the Logan City Landfill; these documents include the groundwater monitoring reports for the two previous years (2010 and 2011) as well as the landfill quarterly reports for 2011 and 2012 and the spill, prevention, control and countermeasure (SPCC) plan for the landfill.

10.1 GROUNDWATER MONITORING REPORTS

Kleinfelder produced the groundwater monitoring reports for the Logan City Landfill for the years reviewed by IGES. Based on information included in these reports, it appears that the groundwater elevation of the shallowest aquifer at the site is approximately 3 to 4 feet below the existing site grade. IGES' review of the groundwater monitoring reports indicated that the groundwater gradient at the site of the landfill is to the west-southwest. Both the 2010 and 2011 groundwater monitoring reports indicate that the findings during the respective years are in general consistent with the findings of previous years. These reports indicate that concentration of several metals were reported to be above the method detection limits (MDL) but that none of them were above the solid waste ground water protection standard (SWGWPS) except for arsenic. Additional studies have been completed by Kleinfelder and Utah State University (USU) to determine if arsenic in the up gradient groundwater may be impacted by naturally occurring arsenic sources or another source in the area. In a 2009 report, Kleinfelder and USU conclude that arsenic is naturally occurring and can be mobilized into the groundwater. Based on the 2010 and 2011 groundwater monitoring reports, it appears that volatile organic compounds (VOC) are present in the groundwater, however, they are not observed at levels that exceed the SWGWPSs. Since approximately 2009 or prior, Logan City Landfill has been participating in a voluntary corrective action program. The purpose of the corrective action program is to collect leachate that has migrated offsite through the groundwater. Mr. Francis with the Logan City Landfill provided additional information on the voluntary corrective action program (Section 9.3).

10.2 QUARTERLY INSPECTION REPORTS

IGES reviewed quarterly inspection reports for the landfill for 2011 and 2012. IGES observed that for these time periods, no adverse findings or observations were made in these reports with one exception. On September 27, 2011, a relatively low level of methane was observed beyond the limits of the landfill.

10.3 SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

IGES completed a brief review of the SPCC plan that was on file with Logan City's Environmental Department. It appears that there are 15 documented oil storage containers on site. The plan calls for an update every 5 years or when changes are made. The SPCC plan appears to be complete and include the minimum required information; the plan was updated in February 2011.

11.0 DATA GAPS

No aerial photographs taken prior to the year 1953 were available for our review. In the 1953 photograph the subject property was undeveloped farm and rangeland with wetland or wetland-like areas. It further appears that the majority of the neighboring properties were also being used for similar purposes. In general, the use of the subject property appears to have been relatively unchanged from 1952 through the present. It is IGES' opinion that the time prior to the 1953 photograph is not a significant data gap.

A data gap of approximately 23 years between photographs for the years 1953 and 1976 exists. We observed no significant changes during this time period; an area of soil disturbance was observed in the 1976 photo, but this appears to be the result of increased traffic. The property continued to be used for agricultural purposes. It is our opinion that this gap in aerial photos is not a significant data gap.

As stated in Section 6.0 (Surrounding Land Use), the majority of the property within the immediate vicinity of the subject property consists of undeveloped properties that are in general currently used for farming or range land and other uses which include rifle ranges, waste water treatment and an auto salvage yard. No readily observable environmental conditions were observed on adjacent properties. There is a potential that areas not subject to our observations may pose an environmental concern. It is our opinion that there are no more data gaps associated with this Phase I ESA.

As stated in Section 4.0, the user did not complete a user questionnaire for the site. Based on the information collected and summarized in other sections of this report, it is our opinion that this is considered an insignificant data gap since no other information presented in this report suggests a potential recognized environmental condition.

IGES has attempted to indicate and assess recognized data gaps; however, it is possible that some data gaps have not been identified. IGES cannot warranty or guarantee that no hazardous substances have been released on the subject property and adjacent properties.

12.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the data and information obtained as part of our scope of work, IGES observed and recommends the following:

1.) The subject property has existed as an undeveloped lot since prior to 1953 and is still undeveloped.
2.) Housekeeping at the site was good.
3.) The historic use of the property is farming of hay and grazing for livestock.
4.) The subject property as it exists today was not listed in any of the ASTM and AAI recommended databases searched by EDR. No adjacent properties were listed in any of the ASTM and AAI recommended databases searched by EDR.

Based on observations made as part of this Phase I ESA and the information contained herein, it is our opinion that there are no obvious recognized environmental conditions on the subject property and that there are no existing environmental conditions on adjacent properties that pose an immediate threat to the subject property.

IGES has no further recommendations at this time. If there are any further questions or concerns regarding this Phase I ESA, please do not hesitate to contact us at (801) 748-4044.

13.0 LIMITATIONS

The information in this report relates only to the referenced property and should not be extrapolated or construed to apply to any other site or property whatsoever. Furthermore, the information presented in this report has been developed, in confidence, at the request of the client. The information regarding the subject property is intended for use in the client's deliberations concerning the property. The information, recommendations and conclusions provided herein apply only to the subject property as it existed during our site reconnaissance. Should site use or conditions change, the information, conclusions and recommendations herein may no longer apply. As stated in the ASTM E 1527-05 standard, this Phase I ESA report has a shelf life of 1 year. Furthermore, in accordance with the current standard of care, certain components of the report will need to be updated if acquisition of the property by the *user* occurs greater than 180 days from completion of this report. If acquisition of this land occurs greater than 1 year from the completion of this report, in accordance with the current standard of care, the *user* should complete a new Phase I ESA.

We declare that to the best of our professional knowledge and belief we meet the definition of *Environmental Professional* as defined in §312.10 of 40 CFR (Code of Federal Regulations) 312 and we have the specific qualifications based on education, training, and experience to assess a *property* of the nature, history, and setting of the subject *property*. We have developed and performed all the appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

IGES has performed the investigation described in this report within the bounds described in our proposal. It has been prepared with the usual care and thoroughness of the consulting profession. We offer no warranty with respect to the information contained in this report. Specifically, no representations regarding the marketability of the property or its suitability for any particular use are made, and none should be inferred based solely on this report. This report is intended to be used in its entirety. No excerpts may be taken to be representative of the findings of this investigation.

Finally, a Phase I Environmental Site Assessment such as the one reported herein, cannot eliminate all of the environmental risks associated with a property. IGES has pursued those avenues of investigation, which, based on the scope of work, the readily available data, and our experience, seemed prudent. Obviously, no definitive representations can be made with respect to those site attributes not subject to view or directly sampled for this investigation (e.g., ground and surface water quality, air quality, etc.). Additionally, the following areas have not been assessed: wetlands, health and safety, ecological resources, air quality, endangered species, asbestos, regulatory compliance, radon, mold, water quality, areas with archeological significance, cultural resources or historic resources. Also, no definitive opinions or conclusions can be made relating to periods for which no information is available, i.e. *data gaps*; no warranty or guarantee can be made. Interviews completed by IGES with current and past property owners, current and past property occupants, the *user*, city and state representatives etc. were completed in accordance with ASTM E 1527-05. However, IGES cannot be liable for and cannot verify the truthfulness, completeness, or content of the interviewee's responses. IGES offers no warranty or guarantee regarding their responses. IGES contacted EDR to complete the records review for databases maintained by the state and federal government. If these databases are not complete, IGES cannot be responsible for deficiencies in these databases and offers no warranty or guarantee as to their completeness.

The *user* should be aware that completing this Phase I ESA in accordance with ASTM E 1527-05 and AAI does not guarantee CERCLA liability protection throughout ownership of the property. The *user* should be aware that AAI describes continuing obligations that the *user* should be aware of and comply with if it is desirable to maintain CERCLA liability protection; the *user* should review EPA's AAI and become familiar with what the continuing obligations are. It is our opinion that we have acted prudently in assessing the high-risk elements of the property.

Respectfully submitted,
IGES, Inc.

LICENSED PROFESSIONAL ENGINEER
DAVID A. PETERSEN
4859918
9·28·12
STATE OF UTAH

David A. Petersen, P.E.
Project Engineer

Reviewed by,

Brett Mickelson

Brett D. Mickelson, P.E.
Principal

14.0 REFERENCES

Aerial photographs available from Automated Geographic Reference Center include: August 10, 2011.

Aerial photographs available from Olympus Aerial Surveys, Inc. include: June 30, 1988; May 24, 1994; April 22, 1998; May 24, 2001; and July 12, 2005.

Black, B.D., Giraud, R.E., Mayes, B.H., 2000, Paleoseismic investigation of the Clarksville, Junction Hills, and Wellsville faults, West Cache fault zone, Cache County, Utah. Utah Geological Survey Special Study 98, 23 p.

Dover, J.H., 1995, Geologic map of the Logan 30' x 60' Quadrangle, Cache and Rich Counties, Utah, and Lincoln and Uinta Counties, Wyoming. US Geological Survey Miscellaneous Investigations Series Map I-2210, scale 1:100,000.

Environmental Data Resources, Inc., Logan Phase I ESA, 2400 West 200 North, Logan, UT 84321, Inquiry Number: 3407549.2s, September 11, 2012, The EDR Radius Map™ Report with GeoCheck®.

Environmental Data Resources, Inc., Logan Phase I ESA, 2400 West 200 North, Logan, UT 84321, Inquiry Number: 3407549.3, September 12, 2012, The EDR Aerial Photo Decade Package.

Environmental Data Resources, Inc., Logan Phase I ESA, 2400 West 200 North, Logan, UT 84321, Inquiry Number: 3407549.4, September 10, 2012, Certified Sanborn® Map Report.

Hecker, S., 1993, Quaternary Tectonics of Utah with Emphasis on Earthquake-Hazard Characterization: Utah Geological Survey, Plate 1a, Bulletin 127, Quaternary Faults and Folds, Utah.

Hintze, L.F., 1980, Geologic Map of Utah: Utah Geological and Mineral Survey Map-A-1, scale 1:500,000.

Hintze, L.F. 1993, Geologic History of Utah, Brigham Young University Studies, Special Publication 7, 202p.

McCalpin, J.P., 1989, Surficial geologic map of the east Cache fault zone, Cache County, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-2107, 1:50,000 scale.

McCalpin, J.P., 1994, Neotectonic deformation along the East Cache fault zone, Cache County, Utah: Utah Geological Survey, Special Study 83, 37 p.

Scott, W.E., McCoy, W.D., Shorba, R.R., and Meyer, R., 1983, Reinterpretation of the exposed record of the last two cycles of Lake Bonneville, western United States: Quaternary Research, v.20, p. 261-285.

United States Geological Survey, Logan, Utah, Quadrangle Map 7.5 Minute Series.

United States Geological Survey, Wellsville, Utah, Quadrangle Map 7.5 Minute Series.

15.0 QUALIFICATIONS

David A. Petersen, P.E.

Title	Project Engineer
Academic Background	B.S., Geological Engineering, University of Utah (2001) A.S., Physical Science, Salt Lake Community College (1998)
Registration	Professional Engineer – Utah (2005) Professional Engineer – Wyoming (2011)
Expertise	Phase I ESAs, Phase II ESAs, Transaction Screen Process ESAs.
Professional Affiliation	Association of Environmental and Engineering Geologists (AEG)

Summary of Experience

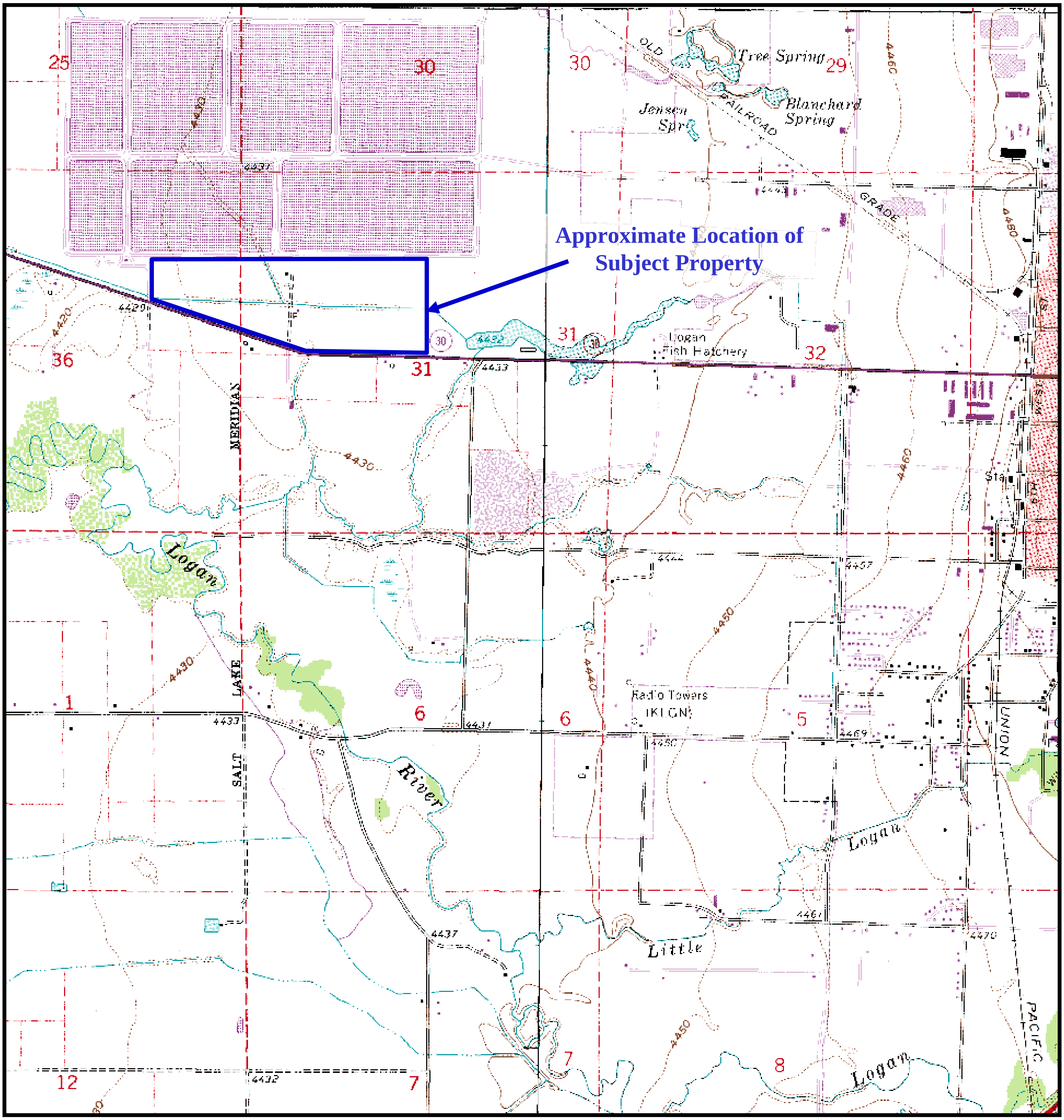
Responsible for conducting numerous Transaction Screen Process ESAs, Phase I ESAs, and Phase II ESAs over the past 6 years. Research included reviewing historical records, databases, conducting interviews with current and past land owners, interviews with land occupants, interviews with appropriate city, county, and state officials, reviewing aerial photography, and performing a site reconnaissance for each site. Listed below are several properties worked on.

- Phase I ESA American Fork.
- Phase I ESA in Bluffdale, Utah.
- Staff engineer responsible for completing a Phase I ESA on six separate properties for the Jordan Valley Water Conservancy District (JVWCD). The properties were in South Jordan, West Jordan, Kaysville, and Clinton, Utah. These sites that range in size from less than one acre to tens of acres were being considered by the JVWCD to purchase as easements.
- Phase I ESA on a 500-acre property in Cedar City, Utah for the State of Utah Trust Lands.
- Phase I ESA on a 4-acre nursery property in Centerville, Utah.
- Phase I ESA on an 18.5-acre property in West Jordan, Utah for a proposed subdivision.
- Phase I ESAs on several properties for proposed restaurant locations for McDonald’s. These include properties in Syracuse, Clinton, and Roy, Utah.
- Phase I ESA for a 9,000 s.f. warehouse building on a 0.4-acre parcel of land in West Valley City, Utah.
- Completed Phase I ESAs for proposed Walmart Distribution Center locations in Payson, Tooele, and Grantsville, Utah. Completed Phase II ESA for proposed distribution center in Tooele.
- Phase I ESA for proposed commercial development in Draper, Utah.
- Phase I ESA and Phase II ESA for new warehouse in Layton, Utah.
- Phase I ESA for office property in Brigham City, Utah.
- Phase II ESA for a proposed buried drinking water storage tank in Layton, Utah.
- Phase I ESA for a proposed restaurant and strip mall development in Midvale, Utah.

- Phase I ESA for proposed commercial development in Farmington, Utah.
- Phase I ESA for a proposed restaurant in Sandy, Utah.
- Phase I ESA for proposed water treatment plant expansion in Ogden, Utah.
- Phase I ESA for a proposed development in Bountiful, Utah. A department store existed on the property at the time of the investigation.
- 3 Phase I ESAs for Weber Basin Water Conservancy District.
- Phase I ESA for an existing gas station in Murray, Utah.
- Phase I ESA for a proposed residential subdivision in Heber City, Utah.
- Phase I ESA for proposed mixed-use development in Draper, Utah.
- Phase I ESA for proposed mixed-use development in Pleasant Grove, Utah.
- Phase I ESA for proposed subdivision in Highland, Utah.
- 2 Phase I ESAs in Herriman, Utah.
- Phase I ESA for proposed 128-acre commercial development by Jordanelle Reservoir, Utah.
- Phase I ESA for 158-acre property in Heber, Utah.
- Phase I ESA for 3-acre property in Salem, Utah.
- Phase I ESA for McDonald's restaurant in Draper, Utah.
- Phase I ESAs for Existing or Proposed Charter School Sites in Santaquin, Pleasant Grove, Springville, Salt Lake City, and Nibley, Utah.

APPENDIX

PLATES



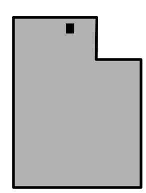
BASE MAPS:
East: LOGAN, UTAH
U.S.G.S. 7.5 MINUTE QUADRANGLE

West: WELLSVILLE, UTAH
U.S.G.S. 7.5 MINUTE QUADRANGLE

0’ 1000’ 2000’

SCALE 1:24,000

Contour Interval is 10 feet



MAP LOCATION

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IGES®

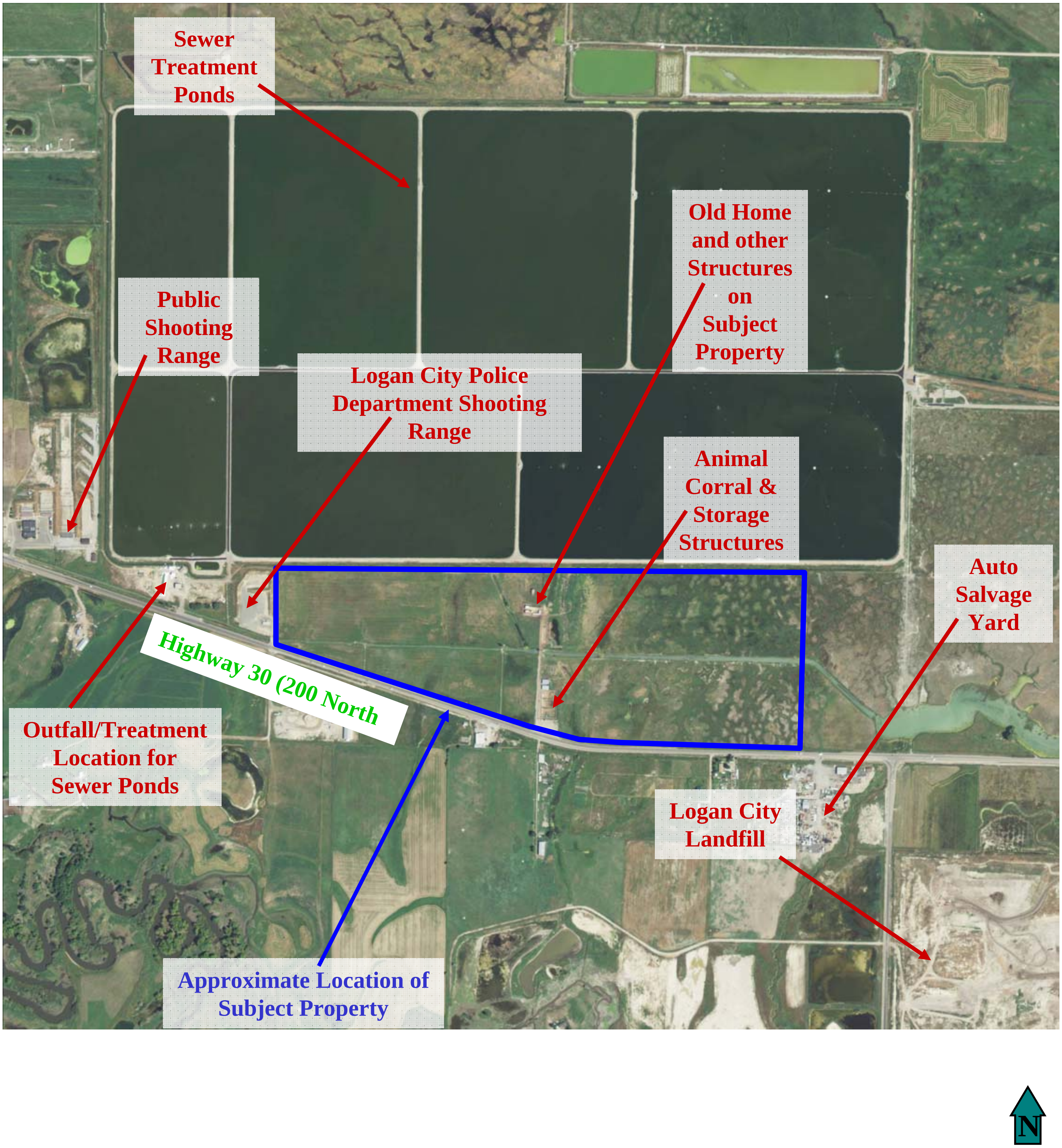
Project Number – 00823-001

Phase I ESA
Proposed Waste Water Treatment Facility
2300 West Highway 30
Logan, Utah

SITE VICINITY MAP

Plate

1



IGES®

Project Number – 00823-011

Phase I ESA
Proposed Waste Water Treatment Facility
2300 West Highway 30
Logan, Utah

Background Photo:
AGRC – August 10, 2011

SITE MAP

Plate

2

Looking north at the subject property from near the center of the southern boundary.

Looking north at the southern animal corral on the subject property near the center of the southern boundary of the subject property.

IGES®

Project Number – 00823-011

Phase I ESA
Proposed Waste Water Treatment Facility
2300 West Highway 30
Logan, Utah

Date of Site Photography:
September 12th, 2012

SITE PHOTOGRAPHY

Plate

3

Looking north along the western portion of the southern animal corral located in the south central portion of the subject property.

One of several water tanks filled with artesian wells on the subject property. This is one of two located in the southern animal corral.

Looking at a structure used to provide shelter from the weather to animals near the southern animal corral.

Plumbing associated with one of the artesian wells providing water to one of the water tanks in the southern animal corral.

Looking northwest from near the center of the subject property.

Looking east between two structures used to provide shelter from the weather to animals near the southern animal corral located in the south central portion of the subject property.

Looking southwest across the subject property from near the center of the subject property.

Looking west along the canal from near the center of the subject property.

Looking east along the canal from near the center of the subject property. One of several artesian wells enclosed in a large rubber tire located on the subject property is seen in the foreground.

Looking southeast from near the center of the subject property.

Looking south along a ditch near the western central portion of the subject property.

Looking northwest from near the western central portion of the subject property.

Looking west across the subject property from near the central western portion of the subject property.

One of numerous frogs located near the canal on the subject property.

Looking northwest across the subject property from near the western boundary of the subject property.

Looking east along the southern boundary of the subject property from near the southwest corner of the subject property.

Looking at a storage shed and covering over the animal feeding area adjacent to the northern animal corral near the north central portion of the subject property.

Looking at a covering over the animal feeding area and storage of hay bales adjacent to the northern animal coral near the north central portion of the subject property.

Looking north to northwest at an old, dilapidated, abandoned wooden home on the subject property near the central portion of the northern boundary of the subject property.

Looking east across the subject property from near the north central portion of the subject property.

Looking southeast to east across the subject property from near the central portion of the northern boundary of the subject property at livestock currently grazing on the subject property.

Looking at an area of ground near the center of the northern boundary of the subject property that appears to have been disturbed by animals.

Looking southeast across the subject property from near the east central portion of the subject property.

Looking at an area in the northeastern portion of the subject property that has either been recently flood irrigated or has shallow groundwater

Looking north to northeast across the subject property from the northeastern portion of the subject property. Another artesian well with a rubber-tire enclosure is seen above the center of the photograph.

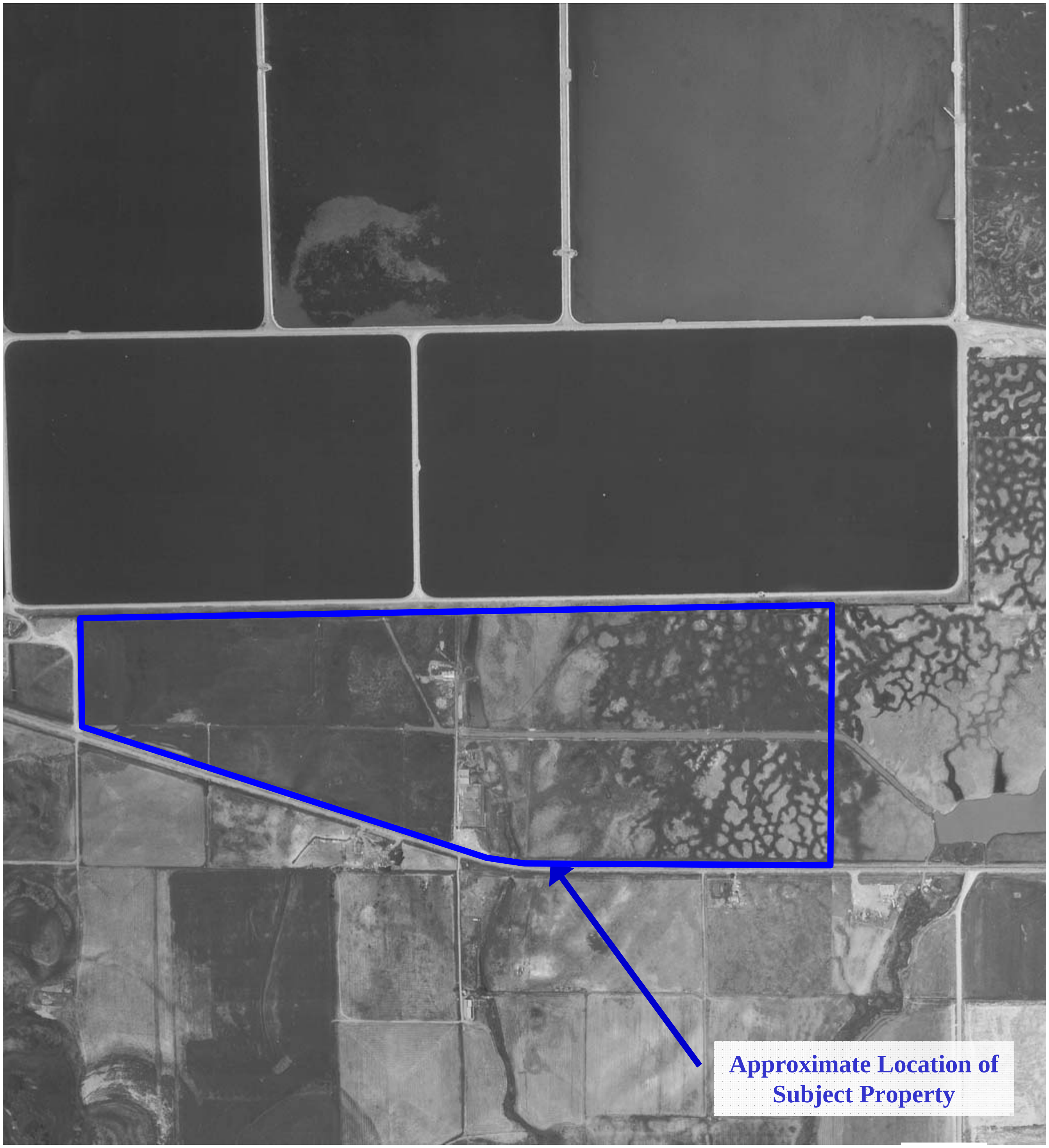
Looking east across the subject property from the northeastern portion of the subject property along the canal.

Looking northeast across the subject property from the northeastern portion of the subject property. Another artesian well with a rubber-tire enclosure is seen above in the center of the photograph.

Looking at some soil spoils near the canal banks in the eastern portion of the subject property. It appears that the spoils have been excavated or removed from the canal.

Looking southeast across the subject property from the southeastern portion of the subject property.

Looking southeast to east across the subject property from the southeastern portion of the subject property.



N

IGES®

Project Number – 00823-011

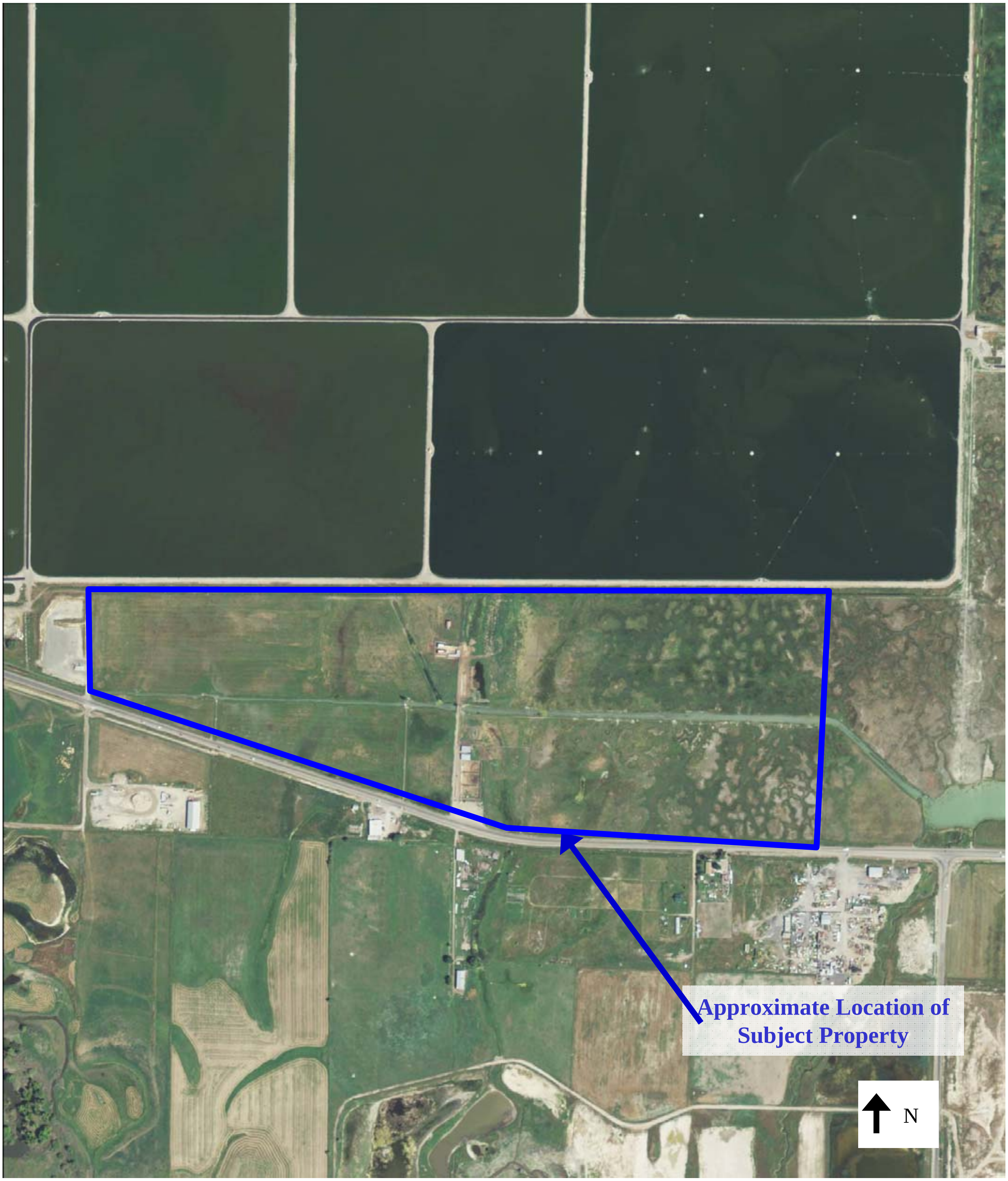
Phase I ESA
Proposed Waste Water Treatment Facility
2300 West Highway 30
Logan, Utah

Date of Aerial Photography:
June 30, 1988

AERIAL PHOTOGRAPHY

Plate

19



IGES®

Project Number – 00823-011

Phase I ESA
Proposed Waste Water Treatment Facility
2300 West Highway 30
Logan, Utah

Date of Aerial Photography:
August 10, 2011

AERIAL PHOTOGRAPHY

Plate

20

EDR Report

Logan Phase I ESA
2400 West 200 North
Logan, UT 84321

Inquiry Number: 3407549.2s
September 11, 2012

The EDR Radius Map™ Report with GeoCheck®

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-05) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

2400 WEST 200 NORTH
LOGAN, UT 84321

COORDINATES

Latitude (North):	41.7379000 - 41˚ 44' 16.44''
Longitude (West):	111.8883000 - 111˚ 53' 17.88''
Universal Tranverse Mercator:	Zone 12
UTM X (Meters):	426129.6
UTM Y (Meters):	4620844.5
Elevation:	4432 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	41111-F8 WELLSVILLE, UT
Most Recent Revision:	1986
North Map:	41111-G8 NEWTON, UT
Most Recent Revision:	1986
East Map:	41111-F7 LOGAN, UT
Most Recent Revision:	1986

AERIAL PHOTOGRAPHY IN THIS REPORT

Photo Year:	2009
Source:	USDA

TARGET PROPERTY SEARCH RESULTS

The target property was identified in the following records. For more information on this property see page 7 of the attached EDR Radius Map report:

Site	Database(s)	EPA ID
LOGAN OUTFALL DISINFECTION FACILI 2400 WEST & SR 30 LOGAN, UT 84323	FINDS	N/A

EXECUTIVE SUMMARY

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL - National Priority List
Proposed NPL - Proposed National Priority List Sites
NPL LIENS - Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL - National Priority List Deletions

Federal CERCLIS list

CERCLIS - Comprehensive Environmental Response, Compensation, and Liability Information System
FEDERAL FACILITY - Federal Facility Site Information listing

Federal CERCLIS NFRAP site List

CERC-NFRAP - CERCLIS No Further Remedial Action Planned

Federal RCRA CORRACTS facilities list

CORRACTS - Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF - RCRA - Treatment, Storage and Disposal

Federal RCRA generators list

RCRA-LQG - RCRA - Large Quantity Generators
RCRA-SQG - RCRA - Small Quantity Generators
RCRA-CESQG - RCRA - Conditionally Exempt Small Quantity Generator

Federal institutional controls / engineering controls registries

US ENG CONTROLS - Engineering Controls Sites List
US INST CONTROL - Sites with Institutional Controls

Federal ERNS list

ERNS - Emergency Response Notification System

State- and tribal - equivalent CERCLIS

SHWS - This state does not maintain a SHWS list. See the Federal CERCLIS list and Federal NPL list.

EXECUTIVE SUMMARY

State and tribal landfill and/or solid waste disposal site lists

SWF/LF - - - - List of Landfills

State and tribal leaking storage tank lists

LUST - - - - Sites with Leaking Underground Storage Tanks
LAST - - - - Leaking Aboveground Storage Tank Sites
INDIAN LUST - - - - Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

UST - - - - List of Sites with Underground Storage Tanks
AST - - - - Listing of Aboveground Storage Tanks
INDIAN UST - - - - Underground Storage Tanks on Indian Land
FEMA UST - - - - Underground Storage Tank Listing

State and tribal institutional control / engineering control registries

INST CONTROL - - - - Sites with Institutional Controls

State and tribal voluntary cleanup sites

VCP - - - - Voluntary Cleanup Sites List
INDIAN VCP - - - - Voluntary Cleanup Priority Listing

State and tribal Brownfields sites

BROWNFIELDS - - - - Brownfields Assessment Sites Listing

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS - - - - A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

DEBRIS REGION 9 - - - - Torres Martinez Reservation Illegal Dump Site Locations
ODI - - - - Open Dump Inventory
INDIAN ODI - - - - Report on the Status of Open Dumps on Indian Lands

Local Lists of Hazardous waste / Contaminated Sites

US CDL - - - - Clandestine Drug Labs
CDL - - - - Methamphetamine Contaminated Properties Listing
US HIST CDL - - - - National Clandestine Laboratory Register

Local Land Records

LIENS 2 - - - - CERCLA Lien Information
LUCIS - - - - Land Use Control Information System

Records of Emergency Release Reports

HMIRS - - - - Hazardous Materials Information Reporting System

EXECUTIVE SUMMARY

SPILLS - Spills Data

Other Ascertainable Records

RCRA-NonGen - RCRA - Non Generators
DOT OPS - Incident and Accident Data
DOD - Department of Defense Sites
FUDS - Formerly Used Defense Sites
CONSENT - Superfund (CERCLA) Consent Decrees
ROD - Records Of Decision
UMTRA - Uranium Mill Tailings Sites
MINES - Mines Master Index File
TRIS - Toxic Chemical Release Inventory System
TSCA - Toxic Substances Control Act
FTTS - FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
HIST FTTS - FIFRA/TSCA Tracking System Administrative Case Listing
SSTS - Section 7 Tracking Systems
ICIS - Integrated Compliance Information System
PADS - PCB Activity Database System
MLTS - Material Licensing Tracking System
RADINFO - Radiation Information Database
RAATS - RCRA Administrative Action Tracking System
UIC - UIC Site Location Listing
DRYCLEANERS - Registered Drycleaners
NPDES - Permitted Facilities Listing
INDIAN RESERV - Indian Reservations
SCRD DRYCLEANERS - State Coalition for Remediation of Drycleaners Listing
FUDS - Formerly Used Defense Sites
US FIN ASSUR - Financial Assurance Information
EPA WATCH LIST - EPA WATCH LIST
PRP - Potentially Responsible Parties
2020 COR ACTION - 2020 Corrective Action Program List
FINANCIAL ASSURANCE - Financial Assurance Information Listing
PCB TRANSFORMER - PCB Transformer Registration Database
COAL ASH DOE - Steam-Electric Plant Operation Data
COAL ASH EPA - Coal Combustion Residues Surface Impoundments List

EDR PROPRIETARY RECORDS

EDR Proprietary Records

Manufactured Gas Plants - EDR Proprietary Manufactured Gas Plants

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were not identified.

Unmappable (orphan) sites are not considered in the foregoing analysis.

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped. Count: 20 records.

Site Name	Database(s)
UDOT # 145 LOGAN SUMMIT	LUST,UST,FINANCIAL ASSURANCE 1
MAVERIK #181	LUST,UST,FINANCIAL ASSURANCE 1
FRONTIER SCIENTIFIC, INC.	FINDS,RCRA-LQG
	ERNS
CITY OF LOGAN SEWER DEPARTMENT	FINDS
LOGAN COACH INC.	FINDS
UDOT STATION #145 LOGAN SUMMIT	FINDS
LOGAN CANYON HIGHWAY	FINDS
LOGAN CITY PARKING	FINDS
LOGAN AIRPORT HANGER C-1	FINDS
CITY OF LOGAN HYDRO PLANT #1	FINDS
CITY OF LOGAN HYDRO PLANT #2	FINDS
LOGAN CITY	FINDS
RUPP'S TRUCKING AND EXCAVATION FOR	FINDS
THE SPRINGS AT LOGAN RIVER PHASE I	FINDS
MAPLE VALLEY APTS. PHASE 2	NPDES
LOGAN COACH INC	NPDES
LOGAN GATEWAY PAD A,B,C	NPDES
SIERRA PARK PHASE 1	NPDES
LOGAN AIRPORT HANGAR C-1	FINANCIAL ASSURANCE 1

OVERVIEW MAP - 3407549.2s

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines from USGS
- National Wetland Inventory
- State Wetlands

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	Logan Phase I ESA	CLIENT:	IGES
ADDRESS:	2400 West 200 North	CONTACT:	David Petersen
	Logan UT 84321	INQUIRY #:	3407549.2s
LAT/LONG:	41.7379 / 111.8883	DATE:	September 11, 2012 12:06 pm

DETAIL MAP - 3407549.2s

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines from USGS
- National Wetland Inventory
- State Wetlands

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: Logan Phase I ESA	CLIENT: IGES
ADDRESS: 2400 West 200 North	CONTACT: David Petersen
Logan UT 84321	INQUIRY #: 3407549.2s
LAT/LONG: 41.7379 / 111.8883	DATE: September 11, 2012 12:06 pm

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	TP		NR	NR	NR	NR	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
CERCLIS	0.500		0	0	0	NR	NR	0
FEDERAL FACILITY	1.000		0	0	0	0	NR	0
Federal CERCLIS NFRAP site List								
CERC-NFRAP	0.500		0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-CESQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
State- and tribal - equivalent CERCLIS								
SHWS	N/A		N/A	N/A	N/A	N/A	N/A	N/A
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	0.500		0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
LUST	0.500		0	0	0	NR	NR	0
LAST	0.500		0	0	0	NR	NR	0
INDIAN LUST	0.500		0	0	0	NR	NR	0
State and tribal registered storage tank lists								
UST	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
FEMA UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
INST CONTROL	0.500		0	0	0	NR	NR	0
State and tribal voluntary cleanup sites								
VCP	0.500		0	0	0	NR	NR	0
INDIAN VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US CDL	TP		NR	NR	NR	NR	NR	0
CDL	TP		NR	NR	NR	NR	NR	0
US HIST CDL	TP		NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
LUCIS	0.500		0	0	0	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
SPILLS	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA-NonGen	0.250		0	0	NR	NR	NR	0
DOT OPS	TP		NR	NR	NR	NR	NR	0
DOD	1.000		0	0	0	0	NR	0
FUDS	1.000		0	0	0	0	NR	0
CONSENT	1.000		0	0	0	0	NR	0
ROD	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
MINES	0.250		0	0	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
TSCA	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
FINDS	TP	1	NR	NR	NR	NR	NR	1
RAATS	TP		NR	NR	NR	NR	NR	0
UIC	TP		NR	NR	NR	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
NPDES	TP		NR	NR	NR	NR	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
FUDS	TP		NR	NR	NR	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
FINANCIAL ASSURANCE	TP		NR	NR	NR	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0

EDR PROPRIETARY RECORDS

EDR Proprietary Records

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
Manufactured Gas Plants	1.000		0	0	0	0	NR	0

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

N/A = This State does not maintain a SHWS list. See the Federal CERCLIS list.

Map ID Direction Distance Elevation	Site	Database(s)	EDR ID Number EPA ID Number

MAP FINDINGS

1 Target Property	**LOGAN OUTFALL DISINFECTION FACILITY 2400 WEST & SR 30 LOGAN, UT 84323**	**FINDS**	**1012073861 N/A**

Actual: 4432 ft.

FINDS:

Registry ID: 110000720104

Environmental Interest/Information System
US EPA Risk Management Plan (RMP) database stores the risk management plans reported by companies that handle, manufacture, use, or store certain flammable or toxic substances, as required under section 112(r) of the Clean Air Act (CAA).

Count: 20 records. ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
LOGAN	1004789104	FRONTIER SCIENTIFIC, INC.	689 WEST 200 SOUTH	84321	FINDS,RCRA-LQG
LOGAN	1005827873	LOGAN CANYON HIGHWAY	LOGAN CANYON	84321	FINDS
LOGAN	1005849546	LOGAN AIRPORT HANGER C-1	LOGAN AIRPORT	84321	FINDS
LOGAN	1005849867	CITY OF LOGAN HYDRO PLANT #1	2 MILES UP LOGAN CANYON ON HWY	84321	FINDS
LOGAN	1005849870	CITY OF LOGAN HYDRO PLANT #2	MOUTH OF LOGAN CANYON ON HWY 8	84321	FINDS
LOGAN	1005850763	LOGAN CITY PARKING	LOGAN CITY PARKING	84321	FINDS
LOGAN	1005856343	UDOT STATION #145 LOGAN SUMMIT	HWY 89 AT 402 S MILE POST	84321	FINDS
LOGAN	1007841338	LOGAN CITY	SITE INFORMATION RESTRICTED	84321	FINDS
LOGAN	1009457101	CITY OF LOGAN SEWER DEPARTMENT	400 WEST, 140 N TO 180 N SEWER	84321	FINDS
LOGAN	1010031456	RUPP'S TRUCKING AND EXCAVATION FOR	1100 WEST STREET: TO 1800 S TO	84321	FINDS
LOGAN	1010351168	LOGAN COACH INC.	800 NORTH 870 WEST	84321	FINDS
LOGAN	1011446423	THE SPRINGS AT LOGAN RIVER PHASE I	1778 SOUTH 1200 WEST	84321	FINDS
LOGAN	99628879		US 89 AT LOGAN CANYON AT MM 38		ERNS
LOGAN	S107868976	LOGAN COACH INC	800 NORTH 870 WEST	84321	NPDES
	S108955011	LOGAN AIRPORT HANGAR C-1	LOGAN AIRPORT	84321	FINANCIAL ASSURANCE 1
LOGAN	S111070213	MAPLE VALLEY APTS. PHASE 2	1593 NORTH 400 WEST	84321	NPDES
NIBLEY	S111070527	SIERRA PARK PHASE 1	1200 WEST 2350 SOUTH	84321	NPDES
LOGAN	S111280982	LOGAN GATEWAY PAD A,B,C	100 WEST HWY -89-91	84321	NPDES
	U000557311	MAVERIK #181	1190 S HWY 165	84332	LUST,UST,FINANCIAL ASSURANCE
	U004137880	UDOT # 145 LOGAN SUMMIT	11871 N HWY 89 AT MP 489.6	84321	LUST,UST,FINANCIAL ASSURANCE

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 05/08/2012
Date Data Arrived at EDR: 05/10/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 5

Source: EPA
Telephone: N/A
Last EDR Contact: 07/05/2012
Next Scheduled EDR Contact: 10/22/2012
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 3
Telephone 215-814-5418

EPA Region 4
Telephone 404-562-8033

EPA Region 5
Telephone 312-886-6686

EPA Region 10
Telephone 206-553-8665

EPA Region 6
Telephone: 214-655-6659

EPA Region 7
Telephone: 913-551-7247

EPA Region 8
Telephone: 303-312-6774

EPA Region 9
Telephone: 415-947-4246

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 03/30/2012
Date Data Arrived at EDR: 04/05/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 40

Source: EPA
Telephone: N/A
Last EDR Contact: 07/05/2012
Next Scheduled EDR Contact: 10/22/2012
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

Federal Delisted NPL site list

DELISTED NPL: National Priority List Deletions
The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 03/30/2012
Date Data Arrived at EDR: 04/05/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 40

Source: EPA
Telephone: N/A
Last EDR Contact: 07/05/2012
Next Scheduled EDR Contact: 10/22/2012
Data Release Frequency: Quarterly

Federal CERCLIS list

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System
CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 12/27/2011
Date Data Arrived at EDR: 02/27/2012
Date Made Active in Reports: 03/12/2012
Number of Days to Update: 14

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 08/28/2012
Next Scheduled EDR Contact: 12/10/2012
Data Release Frequency: Quarterly

FEDERAL FACILITY: Federal Facility Site Information listing
A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 12/10/2010
Date Data Arrived at EDR: 01/11/2011
Date Made Active in Reports: 02/16/2011
Number of Days to Update: 36

Source: Environmental Protection Agency
Telephone: 703-603-8704
Last EDR Contact: 07/13/2012
Next Scheduled EDR Contact: 10/22/2012
Data Release Frequency: Varies

Federal CERCLIS NFRAP site List

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned
Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

Date of Government Version: 12/28/2011
Date Data Arrived at EDR: 02/27/2012
Date Made Active in Reports: 03/12/2012
Number of Days to Update: 14

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 08/28/2012
Next Scheduled EDR Contact: 12/10/2012
Data Release Frequency: Quarterly

Federal RCRA CORRACTS facilities list

CORRACTS: Corrective Action Report
CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 08/19/2011
Date Data Arrived at EDR: 08/31/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 132

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 08/07/2012
Next Scheduled EDR Contact: 11/26/2012
Data Release Frequency: Quarterly

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 03/15/2012
Date Data Arrived at EDR: 04/04/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 41

Source: Environmental Protection Agency
Telephone: 303-312-6149
Last EDR Contact: 08/16/2012
Next Scheduled EDR Contact: 10/15/2012
Data Release Frequency: Quarterly

Federal RCRA generators list

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 03/15/2012
Date Data Arrived at EDR: 04/04/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 41

Source: Environmental Protection Agency
Telephone: 303-312-6149
Last EDR Contact: 08/16/2012
Next Scheduled EDR Contact: 10/15/2012
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 03/15/2012
Date Data Arrived at EDR: 04/04/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 41

Source: Environmental Protection Agency
Telephone: 303-312-6149
Last EDR Contact: 08/16/2012
Next Scheduled EDR Contact: 10/15/2012
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 03/15/2012
Date Data Arrived at EDR: 04/04/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 41

Source: Environmental Protection Agency
Telephone: 303-312-6149
Last EDR Contact: 08/16/2012
Next Scheduled EDR Contact: 10/15/2012
Data Release Frequency: Varies

Federal institutional controls / engineering controls registries

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 12/30/2011
Date Data Arrived at EDR: 12/30/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 11

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 09/05/2012
Next Scheduled EDR Contact: 12/24/2012
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 12/30/2011
Date Data Arrived at EDR: 12/30/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 11

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 09/05/2012
Next Scheduled EDR Contact: 12/24/2012
Data Release Frequency: Varies

Federal ERNS list

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 04/02/2012
Date Data Arrived at EDR: 04/03/2012
Date Made Active in Reports: 06/14/2012
Number of Days to Update: 72

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 07/02/2012
Next Scheduled EDR Contact: 10/15/2012
Data Release Frequency: Annually

State- and tribal - equivalent CERCLIS

SHWS: This state does not maintain a SHWS list. See the Federal CERCLIS list and Federal NPL list.

State Hazardous Waste Sites. State hazardous waste site records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: Department of Environmental Quality
Telephone: 801-536-4100
Last EDR Contact: 08/03/2012
Next Scheduled EDR Contact: 11/19/2012
Data Release Frequency: N/A

State and tribal landfill and/or solid waste disposal site lists

SWF/LF: List of Landfills

Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 06/01/2011
Date Data Arrived at EDR: 08/31/2011
Date Made Active in Reports: 09/14/2011
Number of Days to Update: 14

Source: Department of Environmental Quality
Telephone: 801-538-6170
Last EDR Contact: 07/13/2012
Next Scheduled EDR Contact: 10/29/2012
Data Release Frequency: Semi-Annually

State and tribal leaking storage tank lists

LUST: Sites with Leaking Underground Storage Tanks
Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 04/23/2012
Date Data Arrived at EDR: 04/27/2012
Date Made Active in Reports: 06/01/2012
Number of Days to Update: 35

Source: Department of Environmental Quality
Telephone: 801-536-4115
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 11/05/2012
Data Release Frequency: Quarterly

LAST: Leaking Aboveground Storage Tank Sites
A listing of leaking aboveground storage tank locations.

Date of Government Version: 06/19/2012
Date Data Arrived at EDR: 06/21/2012
Date Made Active in Reports: 07/23/2012
Number of Days to Update: 32

Source: Department of Environmental Quality
Telephone: 801-536-4141
Last EDR Contact: 09/06/2012
Next Scheduled EDR Contact: 12/24/2012
Data Release Frequency: Varies

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 04/12/2012
Date Data Arrived at EDR: 05/09/2012
Date Made Active in Reports: 07/10/2012
Number of Days to Update: 62

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 08/03/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 12/14/2011
Date Data Arrived at EDR: 12/15/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 26

Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Semi-Annually

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 09/12/2011
Date Data Arrived at EDR: 09/13/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 59

Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Varies

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 02/07/2012
Date Data Arrived at EDR: 02/17/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 88

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 08/18/2011
Date Data Arrived at EDR: 08/19/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 25

Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 11/26/2012
Data Release Frequency: Quarterly

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 05/25/2012
Date Data Arrived at EDR: 05/25/2012
Date Made Active in Reports: 07/16/2012
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Quarterly

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 05/07/2012
Date Data Arrived at EDR: 05/08/2012
Date Made Active in Reports: 07/10/2012
Number of Days to Update: 63

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Quarterly

State and tribal registered storage tank lists

UST: List of Sites with Underground Storage Tanks
Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 04/23/2012
Date Data Arrived at EDR: 04/27/2012
Date Made Active in Reports: 05/31/2012
Number of Days to Update: 34

Source: Department of Environmental Quality
Telephone: 801-536-4115
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 11/05/2012
Data Release Frequency: Quarterly

AST: Listing of Aboveground Storage Tanks
Aboveground storage tank site locations.

Date of Government Version: 06/19/2012
Date Data Arrived at EDR: 06/21/2012
Date Made Active in Reports: 07/23/2012
Number of Days to Update: 32

Source: Department of Environmental Quality
Telephone: 801-536-4100
Last EDR Contact: 09/06/2012
Next Scheduled EDR Contact: 12/24/2012
Data Release Frequency: Varies

INDIAN UST R7: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 02/07/2012
Date Data Arrived at EDR: 02/17/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 88

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

INDIAN UST R6: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 05/10/2011
Date Data Arrived at EDR: 05/11/2011
Date Made Active in Reports: 06/14/2011
Number of Days to Update: 34

Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Semi-Annually

INDIAN UST R5: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 02/28/2012
Date Data Arrived at EDR: 02/29/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 76

Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Varies

INDIAN UST R4: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 12/14/2011
Date Data Arrived at EDR: 12/15/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 26

Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Semi-Annually

INDIAN UST R1: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 04/12/2012
Date Data Arrived at EDR: 05/02/2012
Date Made Active in Reports: 07/16/2012
Number of Days to Update: 75

Source: EPA, Region 1
Telephone: 617-918-1313
Last EDR Contact: 08/03/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Varies

INDIAN UST R8: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 08/18/2011
Date Data Arrived at EDR: 08/19/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 25

Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Quarterly

INDIAN UST R10: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 05/07/2012
Date Data Arrived at EDR: 05/08/2012
Date Made Active in Reports: 07/16/2012
Number of Days to Update: 69

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 07/26/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Quarterly

INDIAN UST R9: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 11/28/2011	Source: EPA Region 9
Date Data Arrived at EDR: 11/29/2011	Telephone: 415-972-3368
Date Made Active in Reports: 01/10/2012	Last EDR Contact: 07/26/2012
Number of Days to Update: 42	Next Scheduled EDR Contact: 11/12/2012
	Data Release Frequency: Quarterly

FEMA UST: Underground Storage Tank Listing
A listing of all FEMA owned underground storage tanks.

Date of Government Version: 01/01/2010	Source: FEMA
Date Data Arrived at EDR: 02/16/2010	Telephone: 202-646-5797
Date Made Active in Reports: 04/12/2010	Last EDR Contact: 07/12/2012
Number of Days to Update: 55	Next Scheduled EDR Contact: 10/29/2012
	Data Release Frequency: Varies

State and tribal institutional control / engineering control registries

INST CONTROL: Sites with Institutional Controls
Sites included on the Brownfields Sites listing that have institutional controls in place.

Date of Government Version: 05/08/2012	Source: Department of Environmental Quality
Date Data Arrived at EDR: 05/09/2012	Telephone: 801-536-4100
Date Made Active in Reports: 06/01/2012	Last EDR Contact: 08/09/2012
Number of Days to Update: 23	Next Scheduled EDR Contact: 11/19/2012
	Data Release Frequency: Varies

State and tribal voluntary cleanup sites

INDIAN VCP R1: Voluntary Cleanup Priority Listing
A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 02/17/2012	Source: EPA, Region 1
Date Data Arrived at EDR: 04/03/2012	Telephone: 617-918-1102
Date Made Active in Reports: 05/15/2012	Last EDR Contact: 07/02/2012
Number of Days to Update: 42	Next Scheduled EDR Contact: 10/15/2012
	Data Release Frequency: Varies

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng
A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008	Source: EPA, Region 7
Date Data Arrived at EDR: 04/22/2008	Telephone: 913-551-7365
Date Made Active in Reports: 05/19/2008	Last EDR Contact: 04/20/2009
Number of Days to Update: 27	Next Scheduled EDR Contact: 07/20/2009
	Data Release Frequency: Varies

VCP: Voluntary Cleanup Sites List
The purpose of the program is to encourage the voluntary cleanup of sites where there has been a contaminant release threatening public health and the environment, thereby removing the stigma attached to these sites which blocks economic redevelopment. Voluntary cleanup of these sites will hopefully result in clearing the pathway for returning these properties to beneficial use.

Date of Government Version: 06/07/2012	Source: Department of Environmental Quality
Date Data Arrived at EDR: 06/08/2012	Telephone: 801-536-4100
Date Made Active in Reports: 07/23/2012	Last EDR Contact: 08/30/2012
Number of Days to Update: 45	Next Scheduled EDR Contact: 12/03/2012
	Data Release Frequency: Varies

State and tribal Brownfields sites

BROWNFIELDS: Brownfields Assessment Sites

A Brownfields site means real property, the expansion, redevelopment or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant or contaminant, controlled substance or petroleum product.

Date of Government Version: 06/07/2012
Date Data Arrived at EDR: 06/08/2012
Date Made Active in Reports: 07/23/2012
Number of Days to Update: 45

Source: Department of Environmental Quality
Telephone: 801-536-4100
Last EDR Contact: 08/30/2012
Next Scheduled EDR Contact: 12/03/2012
Data Release Frequency: Varies

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS: A Listing of Brownfields Sites

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 06/27/2011
Date Data Arrived at EDR: 06/27/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 78

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 06/25/2012
Next Scheduled EDR Contact: 10/08/2012
Data Release Frequency: Semi-Annually

Local Lists of Landfill / Solid Waste Disposal Sites

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations

A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137

Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 07/03/2012
Next Scheduled EDR Contact: 10/08/2012
Data Release Frequency: No Update Planned

ODI: Open Dump Inventory

An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands

Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 08/03/2012
Next Scheduled EDR Contact: 11/19/2012
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Local Lists of Hazardous waste / Contaminated Sites

US CDL: Clandestine Drug Labs

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 03/16/2012
Date Data Arrived at EDR: 06/12/2012
Date Made Active in Reports: 07/16/2012
Number of Days to Update: 34

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 09/05/2012
Next Scheduled EDR Contact: 12/17/2012
Data Release Frequency: Quarterly

CDL: Methamphetamine Contaminated Properties Listing

Utah Administrative Rule 19-6-901 Illegal Drug Operations Site Reporting and Decontamination Act requires local health departments to maintain a list of properties believed to be contaminated by the illegal manufacture of drugs. The following properties were reported to the Salt Lake Valley Health Department by a complaint or report from a law enforcement agency and the Department has determined that reasonable evidence exists that the property is contaminated.

Date of Government Version: 04/26/2012
Date Data Arrived at EDR: 05/31/2012
Date Made Active in Reports: 07/23/2012
Number of Days to Update: 53

Source: Salt Lake Valley Health Department
Telephone: 801-468-2750
Last EDR Contact: 08/29/2012
Next Scheduled EDR Contact: 12/10/2012
Data Release Frequency: Varies

US HIST CDL: National Clandestine Laboratory Register

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 09/01/2007
Date Data Arrived at EDR: 11/19/2008
Date Made Active in Reports: 03/30/2009
Number of Days to Update: 131

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/23/2009
Next Scheduled EDR Contact: 06/22/2009
Data Release Frequency: No Update Planned

Local Land Records

LIENS 2: CERCLA Lien Information

A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 02/16/2012
Date Data Arrived at EDR: 03/26/2012
Date Made Active in Reports: 06/14/2012
Number of Days to Update: 80

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 07/27/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Varies

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 12/09/2005
Date Data Arrived at EDR: 12/11/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 31

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 05/21/2012
Next Scheduled EDR Contact: 09/03/2012
Data Release Frequency: Varies

Records of Emergency Release Reports

HMIRS: Hazardous Materials Information Reporting System
Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 04/01/2012
Date Data Arrived at EDR: 04/03/2012
Date Made Active in Reports: 06/14/2012
Number of Days to Update: 72

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 07/02/2012
Next Scheduled EDR Contact: 10/15/2012
Data Release Frequency: Annually

SPILLS: Spills Data
Incidents reported to the Division of Environmental Response and Remediation

Date of Government Version: 04/16/2012
Date Data Arrived at EDR: 04/17/2012
Date Made Active in Reports: 05/03/2012
Number of Days to Update: 16

Source: Department of Environmental Quality
Telephone: 801-536-4100
Last EDR Contact: 07/13/2012
Next Scheduled EDR Contact: 10/29/2012
Data Release Frequency: Semi-Annually

Other Ascertainable Records

RCRA-NonGen: RCRA - Non Generators
RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 03/15/2012
Date Data Arrived at EDR: 04/04/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 41

Source: Environmental Protection Agency
Telephone: 303-312-6149
Last EDR Contact: 08/16/2012
Next Scheduled EDR Contact: 10/15/2012
Data Release Frequency: Varies

DOT OPS: Incident and Accident Data
Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 07/29/2011
Date Data Arrived at EDR: 08/09/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 94

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 08/07/2012
Next Scheduled EDR Contact: 11/19/2012
Data Release Frequency: Varies

DOD: Department of Defense Sites
This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 07/19/2012
Next Scheduled EDR Contact: 10/29/2012
Data Release Frequency: Semi-Annually

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

FUDS: Formerly Used Defense Sites
The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 08/12/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 112

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 09/10/2012
Next Scheduled EDR Contact: 12/24/2012
Data Release Frequency: Varies

CONSENT: Superfund (CERCLA) Consent Decrees
Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 12/01/2011
Date Data Arrived at EDR: 01/25/2012
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 36

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 06/27/2012
Next Scheduled EDR Contact: 10/15/2012
Data Release Frequency: Varies

ROD: Records Of Decision
Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 02/27/2012
Date Data Arrived at EDR: 03/14/2012
Date Made Active in Reports: 06/14/2012
Number of Days to Update: 92

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 06/13/2012
Next Scheduled EDR Contact: 09/24/2012
Data Release Frequency: Annually

UMTRA: Uranium Mill Tailings Sites
Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 09/14/2010
Date Data Arrived at EDR: 10/07/2011
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 146

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 08/28/2012
Next Scheduled EDR Contact: 12/10/2012
Data Release Frequency: Varies

MINES: Mines Master Index File
Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 08/18/2011
Date Data Arrived at EDR: 09/08/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 21

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 09/04/2012
Next Scheduled EDR Contact: 12/17/2012
Data Release Frequency: Semi-Annually

TRIS: Toxic Chemical Release Inventory System
Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 09/01/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 131

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 08/31/2012
Next Scheduled EDR Contact: 12/10/2012
Data Release Frequency: Annually

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2006
Date Data Arrived at EDR: 09/29/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 64

Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 06/29/2012
Next Scheduled EDR Contact: 10/08/2012
Data Release Frequency: Every 4 Years

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 08/22/2012
Next Scheduled EDR Contact: 12/10/2012
Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 08/22/2012
Next Scheduled EDR Contact: 12/10/2012
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing

A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing

A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

SSTS: Section 7 Tracking Systems

Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/10/2010
Date Made Active in Reports: 02/25/2011
Number of Days to Update: 77

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 07/27/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System

The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 07/20/2011
Date Data Arrived at EDR: 11/10/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 61

Source: Environmental Protection Agency
Telephone: 202-564-5088
Last EDR Contact: 06/21/2012
Next Scheduled EDR Contact: 10/08/2012
Data Release Frequency: Quarterly

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 11/01/2010
Date Data Arrived at EDR: 11/10/2010
Date Made Active in Reports: 02/16/2011
Number of Days to Update: 98

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 07/19/2012
Next Scheduled EDR Contact: 10/29/2012
Data Release Frequency: Annually

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 06/21/2011
Date Data Arrived at EDR: 07/15/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 60

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 09/05/2012
Next Scheduled EDR Contact: 12/24/2012
Data Release Frequency: Quarterly

RADINFO: Radiation Information Database

The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 01/10/2012
Date Data Arrived at EDR: 01/12/2012
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 49

Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 07/11/2012
Next Scheduled EDR Contact: 10/22/2012
Data Release Frequency: Quarterly

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 10/23/2011
Date Data Arrived at EDR: 12/13/2011
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 79

Source: EPA
Telephone: (303) 312-6312
Last EDR Contact: 06/12/2012
Next Scheduled EDR Contact: 09/24/2012
Data Release Frequency: Quarterly

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 03/01/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 62

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 08/31/2012
Next Scheduled EDR Contact: 12/10/2012
Data Release Frequency: Biennially

UIC: UIC Site Location Listing

A listing of underground injection control wells.

Date of Government Version: 06/05/2012
Date Data Arrived at EDR: 06/06/2012
Date Made Active in Reports: 07/23/2012
Number of Days to Update: 47

Source: Department of Natural Resources
Telephone: 801-538-5329
Last EDR Contact: 09/06/2012
Next Scheduled EDR Contact: 12/17/2012
Data Release Frequency: Quarterly

DRYCLEANERS: Registered Drycleaners

A listing of registered drycleaners.

Date of Government Version: 03/31/2012
Date Data Arrived at EDR: 04/27/2012
Date Made Active in Reports: 06/01/2012
Number of Days to Update: 35

Source: Department of Environmental Quality
Telephone: 801-536-4437
Last EDR Contact: 07/19/2012
Next Scheduled EDR Contact: 11/05/2012
Data Release Frequency: Varies

NPDES: Permitted Facilities Listing

A listing of Division of Water Quality permits.

Date of Government Version: 06/24/2012
Date Data Arrived at EDR: 06/29/2012
Date Made Active in Reports: 07/27/2012
Number of Days to Update: 28

Source: Department of Environmental Quality
Telephone: 801-538-6146
Last EDR Contact: 06/18/2012
Next Scheduled EDR Contact: 10/01/2012
Data Release Frequency: Varies

INDIAN RESERV: Indian Reservations

This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 12/08/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 34

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 07/19/2012
Next Scheduled EDR Contact: 10/29/2012
Data Release Frequency: Semi-Annually

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing

The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 03/07/2011
Date Data Arrived at EDR: 03/09/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 54

Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 07/19/2012
Next Scheduled EDR Contact: 11/05/2012
Data Release Frequency: Varies

US FIN ASSUR: Financial Assurance Information

All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 05/24/2012
Date Data Arrived at EDR: 06/05/2012
Date Made Active in Reports: 06/14/2012
Number of Days to Update: 9

Source: Environmental Protection Agency
Telephone: 202-566-1917
Last EDR Contact: 08/14/2012
Next Scheduled EDR Contact: 12/03/2012
Data Release Frequency: Quarterly

FUDS: Formerly Used Defense Sites

Formerly used defense sites.

Date of Government Version: 06/29/2009
Date Data Arrived at EDR: 02/03/2012
Date Made Active in Reports: 03/06/2012
Number of Days to Update: 32

Source: Utah AGRC
Telephone: 801-538-3665
Last EDR Contact: 07/31/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Varies

PRP: Potentially Responsible Parties

A listing of verified Potentially Responsible Parties

Date of Government Version: 02/27/2012
Date Data Arrived at EDR: 04/04/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 41

Source: EPA
Telephone: 202-564-6023
Last EDR Contact: 07/02/2012
Next Scheduled EDR Contact: 10/15/2012
Data Release Frequency: Quarterly

FEDLAND: Federal and Indian Lands

Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 02/06/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 339

Source: U.S. Geological Survey
Telephone: 888-275-8747
Last EDR Contact: 07/19/2012
Next Scheduled EDR Contact: 10/29/2012
Data Release Frequency: N/A

PCB TRANSFORMER: PCB Transformer Registration Database

The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 02/01/2011
Date Data Arrived at EDR: 10/19/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 83

Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 08/03/2012
Next Scheduled EDR Contact: 11/12/2012
Data Release Frequency: Varies

EPA WATCH LIST: EPA WATCH LIST

EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 03/31/2012
Date Data Arrived at EDR: 05/17/2012
Date Made Active in Reports: 06/14/2012
Number of Days to Update: 28

Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 08/07/2012
Next Scheduled EDR Contact: 11/26/2012
Data Release Frequency: Quarterly

FINANCIAL ASSURANCE 2: Financial Assurance Information Listing

Financial assurance information for underground storage tank facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay

Date of Government Version: 06/19/2012
Date Data Arrived at EDR: 06/21/2012
Date Made Active in Reports: 07/23/2012
Number of Days to Update: 32

Source: Department of Environmental Quality
Telephone: 801-536-4141
Last EDR Contact: 09/06/2012
Next Scheduled EDR Contact: 12/24/2012
Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List

A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 08/17/2010
Date Data Arrived at EDR: 01/03/2011
Date Made Active in Reports: 03/21/2011
Number of Days to Update: 77

Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 06/12/2012
Next Scheduled EDR Contact: 09/24/2012
Data Release Frequency: Varies

FINANCIAL ASSURANCE 1: Financial Assurance Information Listing

Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 04/11/2012
Date Data Arrived at EDR: 04/17/2012
Date Made Active in Reports: 05/01/2012
Number of Days to Update: 14

Source: Department of Environmental Quality
Telephone: 801-538-6794
Last EDR Contact: 07/13/2012
Next Scheduled EDR Contact: 10/29/2012
Data Release Frequency: Varies

2020 COR ACTION: 2020 Corrective Action Program List

The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 11/11/2011
Date Data Arrived at EDR: 05/18/2012
Date Made Active in Reports: 05/25/2012
Number of Days to Update: 7

Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 08/16/2012
Next Scheduled EDR Contact: 11/26/2012
Data Release Frequency: Varies

COAL ASH DOE: Sleam-Electric Plan Operation Data
A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 76

Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 07/16/2012
Next Scheduled EDR Contact: 10/29/2012
Data Release Frequency: Varies

EDR PROPRIETARY RECORDS

EDR Proprietary Records

Manufactured Gas Plants: EDR Proprietary Manufactured Gas Plants
The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

NY MANIFEST: Facility and Manifest Data
Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a TSD facility.

Date of Government Version: 05/01/2012
Date Data Arrived at EDR: 05/09/2012
Date Made Active in Reports: 06/14/2012
Number of Days to Update: 36

Source: Department of Environmental Conservation
Telephone: 518-402-8651
Last EDR Contact: 08/09/2012
Next Scheduled EDR Contact: 11/19/2012
Data Release Frequency: Annually

PA MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2010
Date Data Arrived at EDR: 04/27/2012
Date Made Active in Reports: 06/05/2012
Number of Days to Update: 39

Source: Department of Environmental Protection
Telephone: 717-783-8990
Last EDR Contact: 07/19/2012
Next Scheduled EDR Contact: 11/05/2012
Data Release Frequency: Annually

WI MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2010
Date Data Arrived at EDR: 08/19/2011
Date Made Active in Reports: 09/15/2011
Number of Days to Update: 27

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 07/16/2012
Next Scheduled EDR Contact: 10/01/2012
Data Release Frequency: Annually

Oil/Gas Pipelines: This data was obtained by EDR from the USGS in 1994. It is referred to by USGS as GeoData Digital Line Graphs from 1:100,000-Scale Maps. It was extracted from the transportation category including some oil, but primarily gas pipelines.

Electric Power Transmission Line Data
Source: Rextag Strategies Corp.
Telephone: (281) 769-2247
U.S. Electric Transmission and Power Plants Systems Digital GIS Data

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.
Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.
Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.
Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.
Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.
Daycare Centers: Child Care Provider List
Source: Department of Health
Telephone: 801-538-9299

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 and 2005 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetlands in Utah
Source: Automated Geographic Reference Center
Telephone: 801-537-9201

Scanned Digital USGS 7.5' Topographic Map (DRG)
Source: United States Geologic Survey
A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey topographic map. The map images are made by scanning published paper maps on high-resolution scanners. The raster image is georeferenced and fit to the Universal Transverse Mercator (UTM) projection.

STREET AND ADDRESS INFORMATION

GEOCHECK ®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

LOGAN PHASE I ESA
2400 WEST 200 NORTH
LOGAN, UT 84321

TARGET PROPERTY COORDINATES

Latitude (North):	41.7379 - 41˚ 44’ 16.44’’
Longitude (West):	111.8883 - 111˚ 53’ 17.88’’
Universal Tranverse Mercator:	Zone 12
UTM X (Meters):	426129.6
UTM Y (Meters):	4620844.5
Elevation:	4432 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	41111-F8 WELLSVILLE, UT
Most Recent Revision:	1986
North Map:	41111-G8 NEWTON, UT
Most Recent Revision:	1986
East Map:	41111-F7 LOGAN, UT
Most Recent Revision:	1986

EDR’s GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principal investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

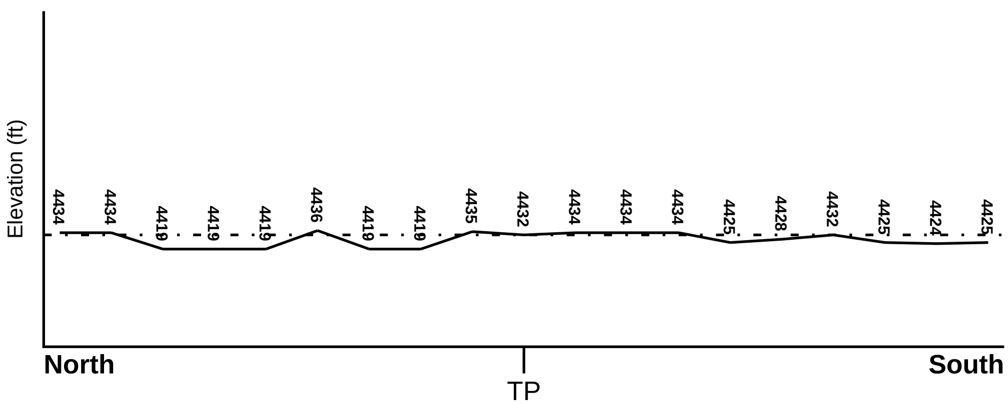
TOPOGRAPHIC INFORMATION

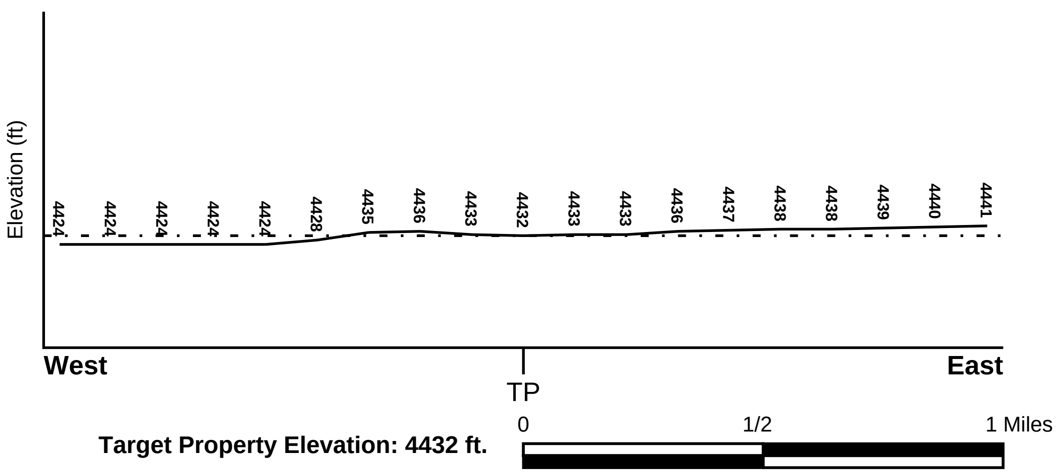
Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General North

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES





Target Property Elevation: 4432 ft.

Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Target Property County	FEMA Flood Electronic Data
CACHE, UT	Not Available

Flood Plain Panel at Target Property: Not Reported

Additional Panels in search area: Not Reported

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
WELLSVILLE	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
Not Reported		

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

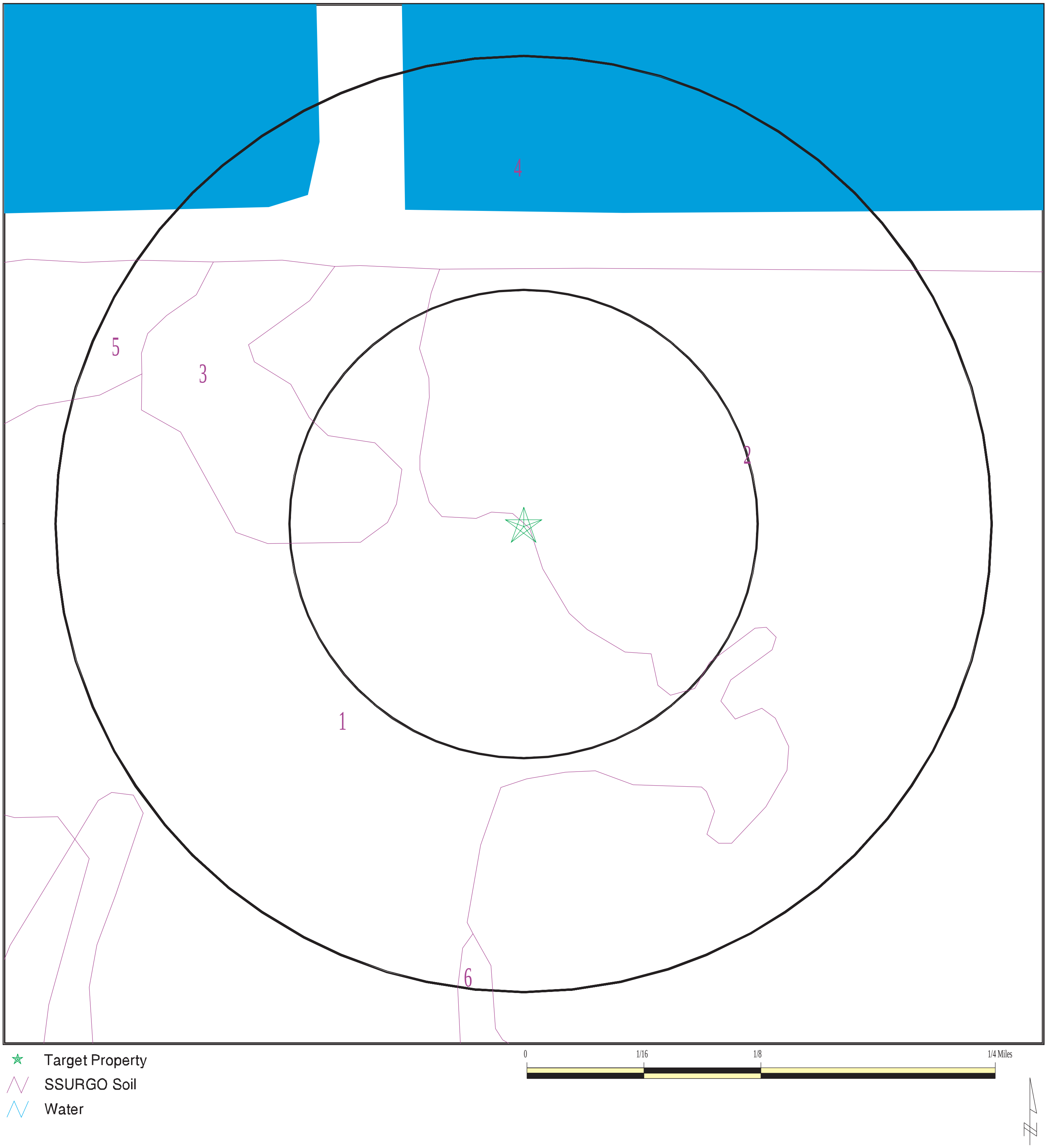
Era:	Cenozoic
System:	Quaternary
Series:	Quaternary
Code:	Q *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: Stratifed Sequence

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

SSURGO SOIL MAP - 3407549.2s



SITE NAME: Logan Phase I ESA ADDRESS: 2400 West 200 North Logan UT 84321 LAT/LONG: 41.7379 / 111.8883	CLIENT: IGES CONTACT: David Petersen INQUIRY #: 3407549.2s DATE: September 11, 2012 12:06 pm

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. The following information is based on Soil Conservation Service SSURGO data.

Soil Map ID: 1

Soil Component Name: Greenson

Soil Surface Texture: loam

Hydrologic Group: Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.

Soil Drainage Class: Somewhat poorly drained

Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 84 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		Soil Reaction (pH)
1	0 inches	7 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 9 Min: 7.9
2	7 inches	16 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 9 Min: 7.9

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		Soil Reaction (pH)
3	16 inches	22 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 9 Min: 7.9
4	22 inches	38 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 9 Min: 7.9
5	38 inches	51 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 9 Min: 7.9
6	51 inches	72 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 9 Min: 7.9

Soil Map ID: 2

Soil Component Name:	Airport
Soil Surface Texture:	silt loam
Hydrologic Group:	Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.
Soil Drainage Class:	Poorly drained

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Hydric Status: All hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 31 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		Soil Reaction (pH)
1	0 inches	3 inches	silt loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 1.4 Min: 0.42	Max: 9 Min: 7.9
2	3 inches	11 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 1.4 Min: 0.42	Max: 9 Min: 7.9
3	11 inches	16 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 1.4 Min: 0.42	Max: 9 Min: 7.9
4	16 inches	25 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 1.4 Min: 0.42	Max: 9 Min: 7.9

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
5	25 inches	59 inches	silt loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 1.4 Min: 0.42	Max: 9 Min: 7.9

Soil Map ID: 3

Soil Component Name: Logan

Soil Surface Texture: silty clay loam

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class: Poorly drained

Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 50 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	12 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 4 Min: 0	Max: 9 Min: 7.4

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
2	12 inches	25 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 4 Min: 0	Max: 9 Min: 7.4
3	25 inches	44 inches	silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 4 Min: 0	Max: 9 Min: 7.4
4	44 inches	59 inches	silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 4 Min: 0	Max: 9 Min: 7.4

Soil Map ID: 4

Soil Component Name: Miscellaneous water

Soil Surface Texture: silty clay loam

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class:
Hydric Status: Unknown

Corrosion Potential - Uncoated Steel: Not Reported

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

No Layer Information available.

Soil Map ID: 5

Soil Component Name: Collett

Soil Surface Texture: silty clay loam

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Somewhat poorly drained

Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 69 inches

Soil Layer Information

	Boundary			Classification			
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil	Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
1	0 inches	7 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay	Max: 1.4 Min: 0.42	Max: 8.4 Min: 7.4
2	7 inches	11 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay	Max: 1.4 Min: 0.42	Max: 8.4 Min: 7.4
3	11 inches	16 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay	Max: 1.4 Min: 0.42	Max: 8.4 Min: 7.4
4	24 inches	33 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay	Max: 1.4 Min: 0.42	Max: 8.4 Min: 7.4
5	33 inches	59 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay	Max: 1.4 Min: 0.42	Max: 8.4 Min: 7.4

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
6	16 inches	24 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay	Max: 1.4 Min: 0.42	Max: 8.4 Min: 7.4

Soil Map ID: 6

Soil Component Name: Greenson

Soil Surface Texture: loam

Hydrologic Group: Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.

Soil Drainage Class: Somewhat poorly drained

Hydric Status: Unknown

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 114 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	7 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 9 Min: 7.9

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		Soil Reaction (pH)
2	7 inches	16 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 9 Min: 7.9
3	16 inches	22 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 9 Min: 7.9
4	22 inches	38 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 9 Min: 7.9
5	38 inches	51 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 9 Min: 7.9
6	51 inches	72 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 9 Min: 7.9

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	Nearest PWS within 1 mile
State Database	1.000

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
A2	USGS3044309	1/8 - 1/4 Mile ESE
C6	USGS3044284	1/8 - 1/4 Mile South
B9	USGS3044303	1/8 - 1/4 Mile WSW
D11	USGS3044283	1/8 - 1/4 Mile SSE
E18	USGS3044286	1/4 - 1/2 Mile ESE
J32	USGS3044288	1/2 - 1 Mile ESE
J33	USGS3044289	1/2 - 1 Mile ESE
K35	USGS3044267	1/2 - 1 Mile South
51	USGS3044277	1/2 - 1 Mile WSW
N59	USGS3044260	1/2 - 1 Mile SSE
P63	USGS3044268	1/2 - 1 Mile SE
66	USGS3044145	1/2 - 1 Mile West
P67	USGS3044266	1/2 - 1 Mile SE
P70	USGS3044265	1/2 - 1 Mile SE
R80	USGS3044300	1/2 - 1 Mile East
R81	USGS3044299	1/2 - 1 Mile East
R82	USGS3044298	1/2 - 1 Mile East
U87	USGS3044158	1/2 - 1 Mile WNW
R99	USGS3044302	1/2 - 1 Mile East
R101	USGS3044297	1/2 - 1 Mile East
Y103	USGS3044317	1/2 - 1 Mile West
Y104	USGS3044142	1/2 - 1 Mile West
X108	USGS3044305	1/2 - 1 Mile East
X109	USGS3044304	1/2 - 1 Mile East
W110	USGS3044301	1/2 - 1 Mile East
W112	USGS3044292	1/2 - 1 Mile East
W113	USGS3044296	1/2 - 1 Mile East
W114	USGS3044294	1/2 - 1 Mile East
W115	USGS3044295	1/2 - 1 Mile East
W116	USGS3044293	1/2 - 1 Mile East
W117	USGS3044287	1/2 - 1 Mile East
X119	USGS3044311	1/2 - 1 Mile East
X120	USGS3044308	1/2 - 1 Mile East

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No PWS System Found		

Note: PWS System location is not always the same as well location.

STATE DATABASE WELL INFORMATION

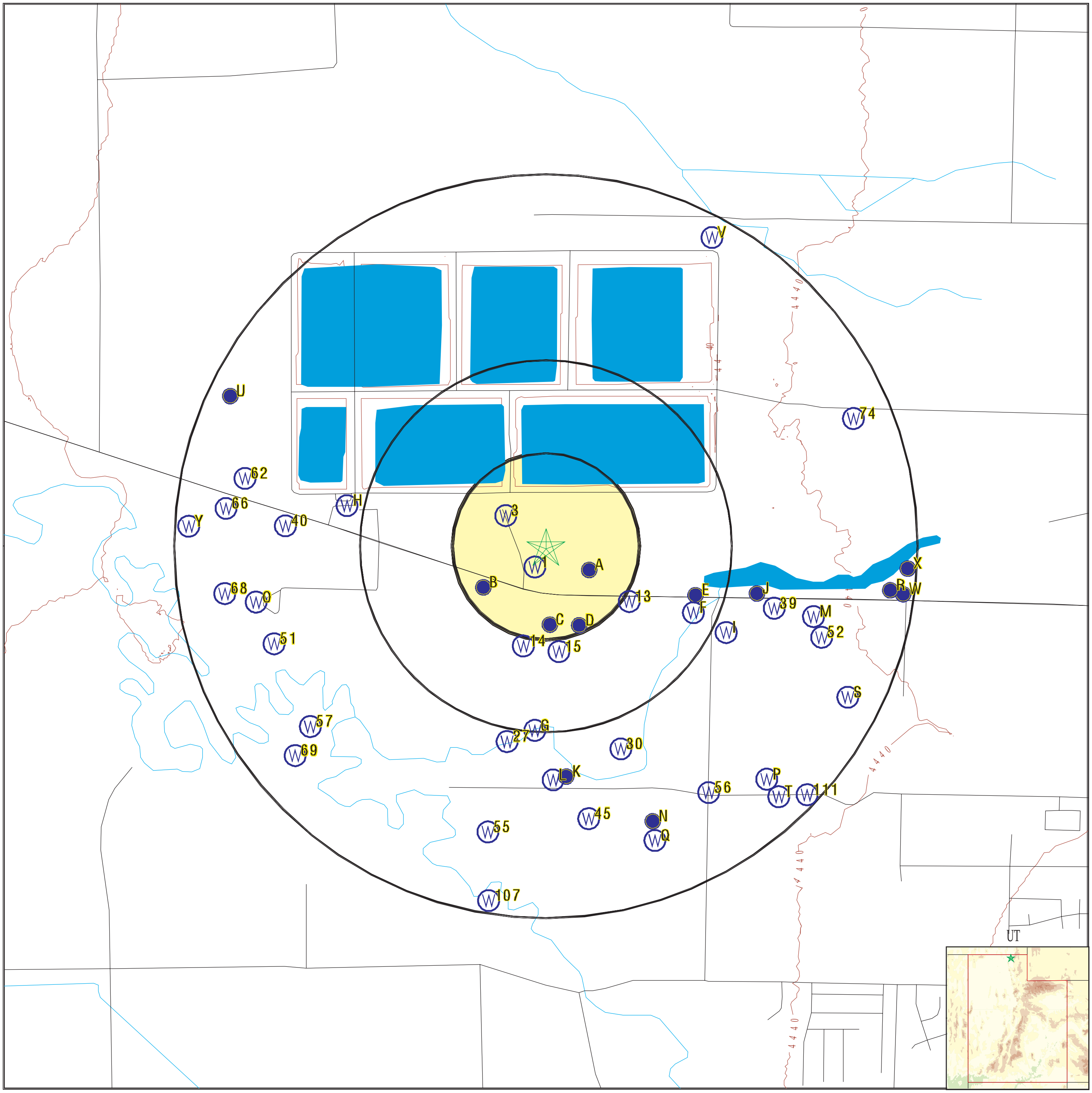
MAP ID	WELL ID	LOCATION FROM TP
1	UT6000000149466	0 - 1/8 Mile SSW
3	UT6000000149551	1/8 - 1/4 Mile NW
A4	UT6000000149454	1/8 - 1/4 Mile ESE
B5	UT6000000149432	1/8 - 1/4 Mile SW
C7	UT6000000149366	1/8 - 1/4 Mile South
C8	UT6000000149365	1/8 - 1/4 Mile South
B10	UT6000000149434	1/8 - 1/4 Mile WSW
D12	UT6000000149358	1/8 - 1/4 Mile SSE
13	UT6000000149395	1/4 - 1/2 Mile ESE
14	UT6000000149312	1/4 - 1/2 Mile SSW
15	UT6000000149308	1/4 - 1/2 Mile South
E16	UT6000000149444	1/4 - 1/2 Mile ESE
F17	UT6000000149382	1/4 - 1/2 Mile ESE
F19	UT6000000149387	1/4 - 1/2 Mile ESE
G20	UT6000000149223	1/4 - 1/2 Mile South
G21	UT6000000149224	1/4 - 1/2 Mile South
G22	UT6000000149208	1/2 - 1 Mile South
G23	UT6000000149209	1/2 - 1 Mile South
H24	UT6000000149569	1/2 - 1 Mile WNW
H25	UT6000000149570	1/2 - 1 Mile WNW
I26	UT6000000149325	1/2 - 1 Mile ESE
27	UT6000000149207	1/2 - 1 Mile South
I28	UT6000000149346	1/2 - 1 Mile ESE
J29	UT6000000149451	1/2 - 1 Mile East
30	UT6000000149203	1/2 - 1 Mile SSE
H31	UT6000000149583	1/2 - 1 Mile WNW
K34	UT6000000149187	1/2 - 1 Mile South
L36	UT6000000149179	1/2 - 1 Mile South
L37	UT6000000149180	1/2 - 1 Mile South
K38	UT6000000149177	1/2 - 1 Mile South
39	UT6000000149390	1/2 - 1 Mile ESE
40	UT6000000149537	1/2 - 1 Mile West
M41	UT6000000149385	1/2 - 1 Mile ESE
M42	UT6000000149386	1/2 - 1 Mile ESE
M43	UT6000000149379	1/2 - 1 Mile ESE
M44	UT6000000149380	1/2 - 1 Mile ESE
45	UT6000000149116	1/2 - 1 Mile South
M46	UT6000000149374	1/2 - 1 Mile ESE
N47	UT6000000149124	1/2 - 1 Mile SSE
N48	UT6000000149125	1/2 - 1 Mile SSE
M49	UT6000000149372	1/2 - 1 Mile ESE
O50	UT6000000149399	1/2 - 1 Mile West
52	UT6000000149322	1/2 - 1 Mile ESE

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
N53	UT6000000149118	1/2 - 1 Mile SSE
N54	UT6000000149119	1/2 - 1 Mile SSE
55	UT6000000149090	1/2 - 1 Mile SSW
56	UT6000000149151	1/2 - 1 Mile SSE
57	UT6000000149216	1/2 - 1 Mile SW
O58	UT6000000149394	1/2 - 1 Mile West
N60	UT6000000149087	1/2 - 1 Mile SSE
N61	UT6000000149088	1/2 - 1 Mile SSE
62	UT6000000149624	1/2 - 1 Mile WNW
Q64	UT6000000149080	1/2 - 1 Mile SSE
Q65	UT6000000149081	1/2 - 1 Mile SSE
68	UT6000000149407	1/2 - 1 Mile West
69	UT6000000149196	1/2 - 1 Mile SW
R71	UT6000000149429	1/2 - 1 Mile East
R72	UT6000000149424	1/2 - 1 Mile East
R73	UT6000000149408	1/2 - 1 Mile East
74	UT6000000149719	1/2 - 1 Mile ENE
S75	UT6000000149261	1/2 - 1 Mile ESE
R76	UT6000000149425	1/2 - 1 Mile East
S77	UT6000000149269	1/2 - 1 Mile ESE
T78	UT6000000149139	1/2 - 1 Mile SE
T79	UT6000000149140	1/2 - 1 Mile SE
R83	UT6000000149453	1/2 - 1 Mile East
R84	UT6000000149439	1/2 - 1 Mile East
R85	UT6000000149442	1/2 - 1 Mile East
R86	UT6000000149427	1/2 - 1 Mile East
R88	UT6000000149428	1/2 - 1 Mile East
U89	UT6000000149750	1/2 - 1 Mile WNW
R90	UT6000000149449	1/2 - 1 Mile East
V91	UT6000000149905	1/2 - 1 Mile NNE
V92	UT6000000149906	1/2 - 1 Mile NNE
V93	UT6000000149907	1/2 - 1 Mile NNE
R94	UT6000000149411	1/2 - 1 Mile East
R95	UT6000000149416	1/2 - 1 Mile East
R96	UT6000000149417	1/2 - 1 Mile East
R97	UT6000000149406	1/2 - 1 Mile East
R98	UT6000000149398	1/2 - 1 Mile East
W100	UT6000000149389	1/2 - 1 Mile East
X102	UT6000000149455	1/2 - 1 Mile East
W105	UT6000000149437	1/2 - 1 Mile East
R106	UT6000000149403	1/2 - 1 Mile East
107	UT6000000148955	1/2 - 1 Mile South
111	UT6000000149143	1/2 - 1 Mile SE
W118	UT6000000149431	1/2 - 1 Mile East

PHYSICAL SETTING SOURCE MAP - 3407549.2s



0 1/4 1/2 1 Miles

- County Boundary
- Major Roads
- Contour Lines
- Earthquake epicenter, Richter 5 or greater
- Water Wells
- Public Water Supply Wells
- Cluster of Multiple Icons
- Groundwater Flow Direction
- G I Indeterminate Groundwater Flow at Location
- G V Groundwater Flow Varies at Location
- Oil, gas or related wells

SITE NAME: Logan Phase I ESA ADDRESS: 2400 West 200 North Logan UT 84321 LAT/LONG: 41.7379 / 111.8883	CLIENT: IGES CONTACT: David Petersen INQUIRY #: 3407549.2s DATE: September 11, 2012 12:06 pm

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID Direction Distance Elevation		Database	EDR ID Number
1 **SSW** **0 - 1/8 Mile** **Higher**		**UT WELLS**	**UT6000000149466**

Water Right Num:	25-4315	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19640000		
Uses:	Stockwatering		
Cubic ft/sec:	.1		
Acre ft:	0		
Location:	N380 E840 W4 31 12N 1E SL		
Well Id:	0		
First Owner:	ELIASON PACKING COMPANY C/O MAX D. ELIASON		
Supply Source:	Underground Water Well		

A2 **ESE** **1/8 - 1/4 Mile** **Higher**		**FED USGS**	**USGS3044309**

Agency cd:	USGS	Site no:	414414111530701
Site name:	(A-12- 1)31bdc- 1		
Latitude:	414414	EDR Site id:	USGS3044309
Longitude:	1115307	Dec lat:	41.73715223
Dec lon:	-111.88605612	Coor meth:	M
Coor accr:	F	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	SWSENWS31 T12N R01E S
Location map:	WELLSVILLE	Map scale:	24000
Altitude:	4432		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	20		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	1934
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	198	Hole depth:	Not Reported
Source of depth data:	Not Reported		
Project number:	464920300		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

Map ID Direction Distance Elevation		Database	EDR ID Number
3 NW 1/8 - 1/4 Mile Higher		**UT WELLS**	**UT6000000149551**

Water Right Num:	25-2364	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	18980000		
Uses:	Stockwatering		
Cubic ft/sec:	.016		
Acre ft:	0		
Location:	S1535 E470 NW 31 12N 1E SL		
Well Id:	0		
First Owner:	ELIASON PACKING COMPANY		
Supply Source:	Underground Water Well		

A4 ESE 1/8 - 1/4 Mile Higher		**UT WELLS**	**UT6000000149454**

Water Right Num:	25-2323	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19340500		
Uses:	Stockwatering		
Cubic ft/sec:	.022		
Acre ft:	0		
Location:	N270 E1615 W4 31 12N 1E SL		
Well Id:	0		
First Owner:	ELIASON PACKING COMPANY		
Supply Source:	Underground Water Well		

B5 SW 1/8 - 1/4 Mile Higher		**UT WELLS**	**UT6000000149432**

Water Right Num:	25-2826	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19290000		
Uses:	Domestic, Irrigation, Stockwatering		
Cubic ft/sec:	.111		
Acre ft:	0		
Location:	N90 E290 W4 31 12N 1E SL		
Well Id:	0		
First Owner:	CACHE HUMANE SOCIETY		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
C6 **South** **1/8 - 1/4 Mile** **Higher**	**FED USGS**	**USGS3044284**

Agency cd:	USGS	Site no:	414406111531501
Site name:	(A-12- 1)31cba- 1		
Latitude:	414406	EDR Site id:	USGS3044284
Longitude:	1115315	Dec lat:	41.73493004
Dec lon:	-111.88827838	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NENWSWS31 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4432.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	192707
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	190	Hole depth:	Not Reported
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1967-08-23	Ground water data end date:	1967-08-23
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1967-08-23	-34.00	

C7 **South** **1/8 - 1/4 Mile** **Higher**	**UT WELLS**	**UT6000000149366**

Water Right Num:	25-2489	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water Claim: Certificated		
Priority Date:	Not Reported		
Uses:	Domestic, Irrigation, Stockwatering		
Cubic ft/sec:	0		
Acre ft:	3.532		
Location:	N2199 E1071 SW 31 12N 1E SL		
Well Id:	0		
First Owner:	BRENT F. AND ANNETTE T. BRYNER		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
C8 **South** **1/8 - 1/4 Mile** **Higher**	**UT WELLS**	**UT6000000149365**

Water Right Num:	25-5656	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19270700		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.049		
Acre ft:	0		
Location:	N2190 E1000 SW 31 12N 1E SL		
Well Id:	0		
First Owner:	MARGIE ANN BECKSTEAD		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
B9 **WSW** **1/8 - 1/4 Mile** **Higher**	**FED USGS**	**USGS3044303**

Agency cd:	USGS	Site no:	414411111532801
Site name:	(A-12- 1)31bcc- 1		
Latitude:	414411	EDR Site id:	USGS3044303
Longitude:	1115328	Dec lat:	41.73631886
Dec lon:	-111.89188961	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	SWSWNWS31 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4431.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1929
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	72.0	Hole depth:	Not Reported
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1967-11-01	Ground water data end date:	1967-11-01
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1967-11-01	-12.00	

B10
WSW
1/8 - 1/4 Mile
Higher

UT WELLS **UT6000000149434**

Water Right Num:	25-2825	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19000000		
Uses:	Other, Stockwatering		
Cubic ft/sec:	.056		
Acre ft:	0		
Location:	N105 E15 W4 31 12N 1E SL		
Well Id:	0		
First Owner:	CACHE HUMANE SOCIETY		
Supply Source:	Underground Water Well		

D11
SSE
1/8 - 1/4 Mile
Higher

FED USGS **USGS3044283**

Agency cd:	USGS	Site no:	414406111531001
Site name:	(A-12- 1)31cab- 1		
Latitude:	414406	EDR Site id:	USGS3044283
Longitude:	1115310	Dec lat:	41.73493006
Dec lon:	-111.88688945	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNESWS31 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4431.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	192707
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	190	Hole depth:	Not Reported
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00

Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1962-04-00	Ground water data end date:	1962-04-00
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1962-04	-31.00	

D12
SSE
1/8 - 1/4 Mile
Higher

UT WELLS **UT6000000149358**

Water Right Num:	25-2489	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water Claim: Certificated		
Priority Date:	Not Reported		
Uses:	Domestic, Irrigation, Stockwatering		
Cubic ft/sec:	0		
Acre ft:	3.532		
Location:	N2157 E1515 SW 31 12N 1E SL		
Well Id:	0		
First Owner:	BRENT F. AND ANNETTE T. BRYNER		
Supply Source:	Underground Water Well		

13
ESE
1/4 - 1/2 Mile
Higher

UT WELLS **UT6000000149395**

Water Right Num:	25-6018	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19730727		
Uses:	Domestic, Irrigation, Stockwatering		
Cubic ft/sec:	.015		
Acre ft:	0		
Location:	N2525 E2140 SW 31 12N 1E SL		
Well Id:	0		
First Owner:	JUAN C. AND FERNANDO REYES		
Supply Source:	Underground Water Well		

14
SSW
1/4 - 1/2 Mile
Higher

UT WELLS **UT6000000149312**

Water Right Num:	25-5695	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19340000		
Uses:	Stockwatering		
Cubic ft/sec:	.002		
Acre ft:	0		
Location:	N1910 E630 SW 31 12N 1E SL		
Well Id:	0		
First Owner:	ASHTON BECKSTEAD		
Supply Source:	Underground Water Well		

15
South
1/4 - 1/2 Mile
Higher

UT WELLS **UT6000000149308**

Water Right Num:	25-2667	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	18800000		
Uses:	Stockwatering		
Cubic ft/sec:	.022		
Acre ft:	0		
Location:	N1825 E1135 SW 31 12N 1E SL		
Well Id:	0		
First Owner:	ASHTON BECKSTEAD		
Supply Source:	Underground Water Well		

E16
ESE
1/4 - 1/2 Mile
Higher

UT WELLS **UT6000000149444**

Water Right Num:	25-5980	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19790628		
Uses:	Irrigation		
Cubic ft/sec:	5.05		
Acre ft:	0		
Location:	N155 W2185 E4 31 12N 1E SL		
Well Id:	0		
First Owner:	LOGAN COW PASTURE WATER COMPANY		
Supply Source:	Underground Water Well		

F17
ESE
1/4 - 1/2 Mile
Higher

UT WELLS **UT6000000149382**

Water Right Num:	25-4773	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19670828		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.152		
Acre ft:	0		
Location:	N2340 W2300 SE 31 12N 1E SL		
Well Id:	0		
First Owner:	MICHAEL K. AND CHERYL ANN BENNETT		
Supply Source:	Underground Water Well		

E18
ESE
1/4 - 1/2 Mile
Higher

FED USGS USGS3044286

Agency cd:	USGS	Site no:	414408111524701
Site name:	(A-12- 1)31dbb- 1		
Latitude:	414408	EDR Site id:	USGS3044286
Longitude:	1115247	Dec lat:	41.73548567
Dec lon:	-111.88050039	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNWSES31 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4430.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	196411
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	171	Hole depth:	Not Reported
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1967-03-06	Ground water data end date:	1967-03-06
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1967-03-06	-36.00	

Map ID Direction Distance Elevation	Database	EDR ID Number
F19 **ESE** **1/4 - 1/2 Mile** **Higher**	**UT WELLS**	**UT6000000149387**

Water Right Num:	25-4198	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19640601		
Uses:	Stockwatering		
Cubic ft/sec:	.015		
Acre ft:	0		
Location:	N2385 E455 S4 31 12N 1E SL		
Well Id:	0		
First Owner:	MICHAEL K. AND CHERYL ANN BENNETT		
Supply Source:	Underground Water Well		

	Database	EDR ID Number
G20 **South** **1/4 - 1/2 Mile** **Lower**	**UT WELLS**	**UT6000000149223**

Water Right Num:	25-2348	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19090000		
Uses:	Stockwatering		
Cubic ft/sec:	.067		
Acre ft:	0		
Location:	N835 E955 SW 31 12N 1E SL		
Well Id:	0		
First Owner:	ASHTON BECKSTEAD		
Supply Source:	Underground Water Well		

	Database	EDR ID Number
G21 **South** **1/4 - 1/2 Mile** **Lower**	**UT WELLS**	**UT6000000149224**

Water Right Num:	25-5694	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19020000		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.067		
Acre ft:	0		
Location:	N840 E620 SW 31 12N 1E SL		
Well Id:	0		
First Owner:	ASHTON BECKSTEAD		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
G22 **South** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149208**

Water Right Num:	25-2347	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water Claim: Certificated		
Priority Date:	19090000		
Uses:	Domestic, Irrigation, Stockwatering		
Cubic ft/sec:	0		
Acre ft:	1.23		
Location:	N583 E775 SW 31 12N 1E SL		
Well Id:	432235		
First Owner:	BRET A. AND JENNY L. ALDER		
Supply Source:	Underground Water Wells		

Map ID Direction Distance Elevation	Database	EDR ID Number
G23 **South** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149209**

Water Right Num:	25-5578	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water Claim: Certificated		
Priority Date:	19340000		
Uses:	Irrigation		
Cubic ft/sec:	0		
Acre ft:	.5		
Location:	N583 E775 SW 31 12N 1E SL		
Well Id:	0		
First Owner:	BRET A. AND JENNY L. ALDER		
Supply Source:	Underground Water Wells		

Map ID Direction Distance Elevation	Database	EDR ID Number
H24 **WNW** **1/2 - 1 Mile** **Lower**	**UT WELLS**	**UT6000000149569**

Water Right Num:	25-10733	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19090101		
Uses:	Irrigation		
Cubic ft/sec:	.243		
Acre ft:	0		
Location:	S1405 W1675 NE 36 12N 1W SL		
Well Id:	0		
First Owner:	LOGAN COW PASTURE WATER COMPANY		
Supply Source:	Underground Water Tile Drain		

Map ID Direction Distance Elevation	Database	EDR ID Number
H25 **WNW** **1/2 - 1 Mile** **Lower**	**UT WELLS**	**UT6000000149570**

Water Right Num:	25-2970	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	1909		
Uses:	Irrigation		
Cubic ft/sec:	18.757		
Acre ft:	0		
Location:	S1405 W1675 NE 36 12N 1W SL		
Well Id:	0		
First Owner:	LOGAN COW PASTURE WATER COMPANY		
Supply Source:	Underground Water Tile Drain		

Map ID Direction Distance Elevation	Database	EDR ID Number
I26 **ESE** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149325**

Water Right Num:	25-7107	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Terminated		
Status:	Appl to Appropriate: Permanently lapsed		
Priority Date:	19761029		
Uses:	Not Reported		
Cubic ft/sec:	.25		
Acre ft:	0		
Location:	S600 W1840 E4 31 12N 1E SL		
Well Id:	0		
First Owner:	CACHE COUNTY CORPORATION		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
27 **South** **1/2 - 1 Mile** **Lower**	**UT WELLS**	**UT6000000149207**

Water Right Num:	25-5693	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19160000		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.011		
Acre ft:	0		
Location:	N555 E385 SW 31 12N 1E SL		
Well Id:	0		
First Owner:	ASHTON BECKSTEAD		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
I28 **ESE** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149346**

Water Right Num:	25-7924	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19790410		
Uses:	Domestic, Irrigation, Stockwatering		
Cubic ft/sec:	.056		
Acre ft:	0		
Location:	N2110 W1700 NE 06 11N 1E SL		
Well Id:	0		
First Owner:	GRANT W. POTTER		
Supply Source:	Underground Water Well		

J29 **East** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149451**

Water Right Num:	25-2962	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19050000		
Uses:	Domestic, Irrigation, Stockwatering		
Cubic ft/sec:	.018		
Acre ft:	0		
Location:	N200 W1390 E4 31 12N 1E SL		
Well Id:	0		
First Owner:	ERNEST DEAN		
Supply Source:	Underground Water Well		

30 **SSE** **1/2 - 1 Mile** **Lower**	**UT WELLS**	**UT6000000149203**

Water Right Num:	25-7302	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Terminated		
Status:	Appl to Appropriate: Permanently lapsed		
Priority Date:	19770310		
Uses:	Domestic, Irrigation, Other, Stockwatering		
Cubic ft/sec:	1		
Acre ft:	0		
Location:	N435 E2000 SW 31 12N 1E SL		
Well Id:	0		
First Owner:	HOWARD B. PETERSON		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
H31 **WNW** **1/2 - 1 Mile** **Lower**	**UT WELLS**	**UT6000000149583**

Water Right Num:	25-8559	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19840316		
Uses:	Other		
Cubic ft/sec:	.015		
Acre ft:	0		
Location:	S1300 W2000 NE 36 12N 1W SL		
Well Id:	8706		
First Owner:	LOGAN CITY CORPORATION		
Supply Source:	Underground Water Well		

	Database	EDR ID Number
J32 **ESE** **1/2 - 1 Mile** **Higher**	**FED USGS**	**USGS3044288**

Agency cd:	USGS	Site no:	414409111523501
Site name:	(A-12- 1)31dab- 1		
Latitude:	414409	EDR Site id:	USGS3044288
Longitude:	1115235	Dec lat:	41.73576348
Dec lon:	-111.87716697	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNESES31 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4433.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	191408
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	VALLEY FILL		
Well depth:	132	Hole depth:	Not Reported
Source of depth data:	owner		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	1960-10-25
Water quality data end date:	1962-08-31	Water quality data count:	3
Ground water data begin date:	1936-10-13	Ground water data end date:	1969-12-04
Ground water data count:	112		

Ground-water levels, Number of Measurements: 112

Date	Feet below Surface	Feet to Sealevel
1969-12-04	-30.70	
1969-06-02	-30.0	
1969-04-01	-31.1	
1969-02-04	-31.9	
1968-12-03	-33.1	
1968-10-01	-32.3	
1968-08-06	-30.8	
1968-06-04	-30.9	
1968-04-01	-31.5	
1968-02-12	-31.7	
1967-12-06	-32.35	
1967-10-06	-31.2	
1966-12-20	-29.3	
1965-12-15	-33.1	
1964-12-17	-31.2	
1963-12-04	-30.8	
1962-12-19	-32.3	
1961-04-11	-32.6	
1960-03-29	-32.8	
1959-03-24	-34.7	
1958-03-19	-35.9	
1957-03-27	-35.7	
1955-12-13	-35.9	
1954-12-07	-35.2	
1953-03-30	-38.1	
1952-04-14	-36.5	
1951-03-28	-37.9	
1950-03-30	-36.8	
1949-08-08	-36.7	
1947-12-30	-36.9	
1946-12-10	-38.3	
1945-12-06	-37.3	
1944-12-19	-35.7	
1943-12-04	-35.8	
1943-04-15	-33.5	
1943-03-06	-34.5	
1942-08-22	-29.5	
1942-03-04	-34.0	
1942-01-28	-34.1	
1941-12-16	-34.0	
1941-12-10	-33.9	
1941-04-04	-34.7	
1941-03-11	-35.0	
1940-06-25	-27.9	
1940-04-01	-35.9	
1940-02-06	-35.7	
1939-09-30	-35.0	
1939-05-31	-34.0	
1939-02-07	-37.7	
1938-10-13	-33.5	
1938-06-24	-32.3	
1938-02-09	-38.55	
1937-11-03	-33.1	
1937-08-06	-31.6	
1937-03-12	-33.6	

Date	Feet below Surface	Feet to Sealevel
1969-07-01	-32.4	
1969-05-06	-30.5	
1969-03-03	-31.3	
1969-01-06	-32.3	
1968-11-06	-33.0	
1968-09-03	-31.8	
1968-07-05	-30.5	
1968-05-07	-31.4	
1968-03-04	-31.0	
1968-01-11	-32.3	
1967-11-08	-29.3	
1967-09-06	-25.9	
1966-03-17	-31.0	
1965-03-31	-31.4	
1964-03-12	-29.4	
1963-03-06	-31.0	
1962-01-08	-32.2	
1960-10-25	-33.1	
1959-12-22	-33.6	
1958-12-03	-37.3	
1957-12-05	-38.0	
1956-04-03	-36.3	
1955-04-08	-35.3	
1954-04-13	-36.1	
1952-10-23	-42.4	
1951-10-31	-40.0	
1950-12-15	-39.7	
1949-12-08	-38.2	
1949-03-28	-34.4	
1947-04-01	-37.1	
1946-03-20	-35.8	
1945-03-01	-35.1	
1944-04-13	-35.1	
1943-04-22	-33.7	
1943-04-06	-33.4	
1942-12-29	-33.2	
1942-04-02	-33.5	
1942-03-03	-34.3	
1942-01-19	-34.0	
1941-12-12	-34.0	
1941-10-07	-29.8	
1941-03-13	-35.1	
1940-12-17	-32.0	
1940-05-01	-35.3	
1940-03-09	-36.0	
1939-12-28	-36.3	
1939-08-08	-32.9	
1939-04-05	-36.4	
1938-12-10	-38.6	
1938-08-19	-32.5	
1938-04-19	-37.1	
1937-12-15	-38.7	
1937-09-30	-27.4	
1937-05-13	-33.1	
1937-01-18	-34.0	

Ground-water levels, continued.

Date	Feet below Surface	Feet to Sealevel	Date	Feet below Surface	Feet to Sealevel
1936-12-14	-34.2		1936-10-13	-32.0	

J33
ESE
1/2 - 1 Mile
Higher

FED USGS **USGS3044289**

Agency cd:	USGS	Site no:	414409111523502
Site name:	(A-12- 1)31dab- 2		
Latitude:	414409	EDR Site id:	USGS3044289
Longitude:	1115235	Dec lat:	41.73576348
Dec lon:	-111.87716697	Coor meth:	M
Coor accr:	T	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNESES31 T12N R01E S
Location map:	WELLSVILLE	Map scale:	24000
Altitude:	4430.		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Valley flat		
Site type:	Ground-water other than Spring	Date construction:	197602
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	VALLEY FILL		
Well depth:	Not Reported	Hole depth:	Not Reported
Source of depth data:	Not Reported		
Project number:	464920300		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	1990-03-01
Water quality data end date:	1991-03-07	Water quality data count:	6
Ground water data begin date:	1977-03-09	Ground water data end date:	2005-03-01
Ground water data count:	52		

Ground-water levels, Number of Measurements: 52

Date	Feet below Surface	Feet to Sealevel	Date	Feet below Surface	Feet to Sealevel
2005-03-01	-30.50		2005-01-07	-30.40	
2004-11-16	-30.50		2004-10-07	-28.25	
2004-08-26	-26.75		2004-06-02	-30.17	
2004-04-16	-30.25		2004-03-03	-29.25	
2003-12-04	-28.58		2003-10-21	-28.75	
2003-09-10	-27.75		2003-03-20	-29.50	
2001-03-08	-32.08		2000-03-01	-34.42	
1999-03-19	-35.58		1998-03-12	-34.00	
1997-03-13	-35.17		1996-03-14	-34.58	
1995-03-08	-33.4		1994-03-08	-31.7	
1993-03-17	-30.90		1992-03-10	-27.30	

Ground-water levels, continued.

Date	Feet below Surface	Feet to Sealevel	Date	Feet below Surface	Feet to Sealevel
1991-03-07	-26.8		1991-01-16	-26.00	
1990-11-28	-28.60		1990-10-29	-31.00	
1990-04-27	-32.60		1990-03-01	-33.20	
1989-09-19	-35.50		1989-03-15	-32.40	
1988-09-23	-33.80		1988-03-03	-37.80	
1987-03-10	-37.80		1986-03-11	-37.70	
1985-09-19	-38.20		1985-03-04	-39.80	
1984-09-07	-43.60		1984-03-02	-39.80	
1983-08-31	-47.10		1983-03-02	-39.30	
1982-09-08	-42.80		1982-03-08	-35.60	
1981-09-17	-33.60		1981-03-02	-38.10	
1980-09-17	-39.30		1980-03-10	-36.40	
1979-09-20	-34.50		1979-03-12	-37.10	
1978-09-20	-38.10		1978-03-09	-36.00	
1977-09-29	-36.20		1977-03-09	-38.40	

K34
South
1/2 - 1 Mile
Lower

UT WELLS **UT6000000149187**

Water Right Num:	25-8517	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19830713		
Uses:	Domestic, Irrigation, Stockwatering		
Cubic ft/sec:	.015		
Acre ft:	0		
Location:	N160 E1380 SW 31 12N 1E SL		
Well Id:	0		
First Owner:	ROBERT C. AND CATHY E. CROSSFIELD		
Supply Source:	Underground Water Well		

K35
South
1/2 - 1 Mile
Higher

FED USGS **USGS3044267**

Agency cd:	USGS	Site no:	414344111531301
Site name:	(A-12- 1)31ccd- 1		
Latitude:	414344	EDR Site id:	USGS3044267
Longitude:	1115313	Dec lat:	41.72881909
Dec lon:	-111.88772275	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	SESWSWS31 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4430.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1909
Date inventoried:	Not Reported	Mean greenwich time offset:	MST

Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	180	Hole depth:	Not Reported
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1968-08-07	Ground water data end date:	1968-08-07
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1968-08-07	-17.00	

L36
South
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149179**

Water Right Num:	25-2347	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water Claim: Certificated		
Priority Date:	19090000		
Uses:	Domestic, Irrigation, Stockwatering		
Cubic ft/sec:	0		
Acre ft:	1.23		
Location:	N4 E1034 SW 31 12N 1E SL		
Well Id:	22869		
First Owner:	BRET A. AND JENNY L. ALDER		
Supply Source:	Underground Water Wells		

L37
South
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149180**

Water Right Num:	25-5578	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water Claim: Certificated		
Priority Date:	19340000		
Uses:	Irrigation		
Cubic ft/sec:	0		
Acre ft:	.5		
Location:	N4 E1034 SW 31 12N 1E SL		
Well Id:	22869		
First Owner:	BRET A. AND JENNY L. ALDER		
Supply Source:	Underground Water Wells		

Map ID Direction Distance Elevation		Database	EDR ID Number
K38 **South** **1/2 - 1 Mile** **Higher**		**UT WELLS**	**UT6000000149177**

Water Right Num:	25-10569	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Approved		
Status:	Appl to Appropriate: Approved		
Priority Date:	20060109		
Uses:	Domestic, Irrigation, Stockwatering		
Cubic ft/sec:	0		
Acre ft:	1.73		
Location:	S20 E1190 NW 06 11N 1E SL		
Well Id:	35632		
First Owner:	JASON LAIRD		
Supply Source:	Underground Water Well		

39 **ESE** **1/2 - 1 Mile** **Higher**		**UT WELLS**	**UT6000000149390**

Water Right Num:	25-2463	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19140000		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.401		
Acre ft:	0		
Location:	S230 W1070 E4 31 12N 1E SL		
Well Id:	0		
First Owner:	GLACUS GREGORY MERRILL		
Supply Source:	Underground Water Well		

40 **West** **1/2 - 1 Mile** **Lower**		**UT WELLS**	**UT6000000149537**

Water Right Num:	25-2745	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19290800		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.011		
Acre ft:	0		
Location:	S1710 E2600 NW 36 12N 1W SL		
Well Id:	0		
First Owner:	JOSEPH E. NIEDERHAUSER		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation		Database	EDR ID Number
M41 **ESE** **1/2 - 1 Mile** **Higher**		**UT WELLS**	**UT6000000149385**

Water Right Num:	25-2410	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19160000		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.134		
Acre ft:	0		
Location:	S297 W565 E4 31 12N 1E SL		
Well Id:	0		
First Owner:	HARRY I. WILLMORE		
Supply Source:	Underground Water Well		

		Database	EDR ID Number
M42 **ESE** **1/2 - 1 Mile** **Higher**		**UT WELLS**	**UT6000000149386**

Water Right Num:	25-5687	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19160000		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.134		
Acre ft:	0		
Location:	S297 W565 E4 31 12N 1E SL		
Well Id:	0		
First Owner:	DEWAIN BERGER		
Supply Source:	Underground Water Well		

		Database	EDR ID Number
M43 **ESE** **1/2 - 1 Mile** **Higher**		**UT WELLS**	**UT6000000149379**

Water Right Num:	25-2409	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19160000		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.2		
Acre ft:	0		
Location:	S350 W565 E4 31 12N 1E SL		
Well Id:	0		
First Owner:	HARRY I. WILLMORE		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
M44 **ESE** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149380**

Water Right Num:	25-5686	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19160000		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.2		
Acre ft:	0		
Location:	S350 W565 E4 31 12N 1E SL		
Well Id:	0		
First Owner:	DEWAIN BERGER		
Supply Source:	Underground Water Well		

Map ID	Database	EDR ID Number
45 **South** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149116**

Water Right Num:	25-2910	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	18800000		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.111		
Acre ft:	0		
Location:	S548 W1115 N4 06 11N 1E SL		
Well Id:	0		
First Owner:	GRANT AND LYNETTE POTTER		
Supply Source:	Underground Water Well		

Map ID	Database	EDR ID Number
M46 **ESE** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149374**

Water Right Num:	25-2941	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19160000		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.045		
Acre ft:	0		
Location:	S390 W435 E4 31 12N 1E SL		
Well Id:	0		
First Owner:	CORPORATION OF THE PRESIDING BISHOP OF THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation			Database	EDR ID Number
N47 **SSE** **1/2 - 1 Mile** **Higher**			**UT WELLS**	**UT6000000149124**

Water Right Num:	25-2345	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19120000		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	0		
Acre ft:	0		
Location:	S425 E2450 NW 06 11N 1E SL		
Well Id:	0		
First Owner:	GERALD J. AND SANDRA C. ALDER		
Supply Source:	Underground Water Well		

N48 **SSE** **1/2 - 1 Mile** **Higher**			**UT WELLS**	**UT6000000149125**

Water Right Num:	25-2341	Exchange:	a21759
Type of right:	Underground		
Status of App:	Approved		
Status:	Appl to Appropriate: Approved		
Priority Date:	19971215		
Uses:	Domestic, Irrigation, Other, Stockwatering		
Cubic ft/sec:	0		
Acre ft:	36.34		
Location:	S425 E2450 NW 06 11N 1E SL		
Well Id:	0		
First Owner:	GERALD J. AND SANDRA C. ALDER		
Supply Source:	Underground Water Wells (4)		

M49 **ESE** **1/2 - 1 Mile** **Higher**			**UT WELLS**	**UT6000000149372**

Water Right Num:	25-2411	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19160000		
Uses:	Irrigation		
Cubic ft/sec:	.096		
Acre ft:	0		
Location:	S445 W385 E4 31 12N 1E SL		
Well Id:	0		
First Owner:	HARRY I. WILLMORE		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
O50 **West** **1/2 - 1 Mile** **Lower**	**UT WELLS**	**UT6000000149399**

Water Right Num:	25-9329	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Certificated		
Priority Date:	19930621		
Uses:	Domestic, Irrigation		
Cubic ft/sec:	.013		
Acre ft:	1.37		
Location:	S2748 E2262 NW 36 12N 1W SL		
Well Id:	13126		
First Owner:	HEBER J. LUNDBERG		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
51 **WSW** **1/2 - 1 Mile** **Lower**	**FED USGS**	**USGS3044277**

Agency cd:	USGS	Site no:	414403111540601
Site name:	(B-12- 1)36cbc- 1		
Latitude:	414403	EDR Site id:	USGS3044277
Longitude:	1115406	Dec lat:	41.73409657
Dec lon:	-111.90244543	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	SWNWSWS36 T12N R01W S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4420.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	1918
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	175	Hole depth:	Not Reported
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1968-10-02	Ground water data end date:	1968-10-02
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1968-10-02	-11.00	

52
ESE
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149322**

Water Right Num:	25-5688	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19340000		
Uses:	Stockwatering		
Cubic ft/sec:	.2		
Acre ft:	0		
Location:	S650 W400 E4 31 12N 1E SL		
Well Id:	0		
First Owner:	DEWAIN BERGER		
Supply Source:	Underground Water Well		

N53
SSE
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149118**

Water Right Num:	25-2343	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19120000		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.111		
Acre ft:	0		
Location:	S540 E2440 NW 06 11N 1E SL		
Well Id:	0		
First Owner:	ALAN J. & SANDRA C. ALDER		
Supply Source:	Underground Water Well		

N54
SSE
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149119**

Water Right Num:	25-2341	Exchange:	a21759
Type of right:	Underground		
Status of App:	Approved		
Status:	Appl to Appropriate: Approved		
Priority Date:	19971215		
Uses:	Domestic, Irrigation, Other, Stockwatering		
Cubic ft/sec:	0		
Acre ft:	36.34		
Location:	S540 E2440 NW 06 11N 1E SL		
Well Id:	0		
First Owner:	GERALD J. AND SANDRA C. ALDER		
Supply Source:	Underground Water Wells (4)		

Map ID Direction Distance Elevation		Database	EDR ID Number
55 **SSW** **1/2 - 1 Mile** **Lower**		**UT WELLS**	**UT6000000149090**

Water Right Num:	25-10393	Exchange:	a28494
Type of right:	Underground		
Status of App:	Terminated		
Status:	Appl to Appropriate: Permanently lapsed		
Priority Date:	20031210		
Uses:	Domestic, Stockwatering		
Cubic ft/sec:	0		
Acre ft:	.73		
Location:	S725 E100 NW 06 11N 1E SL		
Well Id:	0		
First Owner:	JACK L. AND TRUDY BROWN		
Supply Source:	Underground Water Wells (2)		

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56 **SSE** **1/2 - 1 Mile** **Higher**		**UT WELLS**	**UT6000000149151**

Water Right Num:	25-10883	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Unapproved		
Status:	Appl to Appropriate: unapproved		
Priority Date:	20080617		
Uses:	Municipal, Other		
Cubic ft/sec:	18		
Acre ft:	13031.4		
Location:	S191 W2055 NE 06 11N 1E SL		
Well Id:	0		
First Owner:	CACHE COUNTY CORPORATION		
Supply Source:	Underground Water Wells		

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57 **SW** **1/2 - 1 Mile** **Lower**		**UT WELLS**	**UT6000000149216**

Water Right Num:	25-2622	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19200000		
Uses:	Irrigation, Other, Stockwatering		
Cubic ft/sec:	.2		
Acre ft:	0		
Location:	N760 E250 S4 36 12N 1W SL		
Well Id:	0		
First Owner:	JODIE R. AND JEANETTE HARRIS		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
O58 West 1/2 - 1 Mile Lower	**UT WELLS**	**UT6000000149394**

Water Right Num:	25-4589	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	WUC		
Priority Date:	19350000		
Uses:	Stockwatering		
Cubic ft/sec:	.002		
Acre ft:	0		
Location:	S185 E2075 W4 36 12N 1W SL		
Well Id:	13126		
First Owner:	HEBER J. LUNDBERG		
Supply Source:	Underground Water Well		

Map ID	Database	EDR ID Number
N59 SSE 1/2 - 1 Mile Higher	**FED USGS**	**USGS3044260**

Agency cd:	USGS	Site no:	414337111525501
Site name:	(A-11- 1) 6bad- 1		
Latitude:	414337	EDR Site id:	USGS3044260
Longitude:	1115255	Dec lat:	41.72687475
Dec lon:	-111.88272259	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	SENENWS06 T11N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4430.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1912
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	180	Hole depth:	Not Reported
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

Map ID Direction Distance Elevation	Database	EDR ID Number
N60 **SSE** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149087**

Water Right Num:	25-2342	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19120000		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.223		
Acre ft:	0		
Location:	S770 E2435 NW 06 11N 1E SL		
Well Id:	0		
First Owner:	ALAN J. & SANDRA C. ALDER		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
N61 **SSE** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149088**

Water Right Num:	25-2341	Exchange:	a21759
Type of right:	Underground		
Status of App:	Approved		
Status:	Appl to Appropriate: Approved		
Priority Date:	19971215		
Uses:	Domestic, Irrigation, Other, Stockwatering		
Cubic ft/sec:	0		
Acre ft:	36.34		
Location:	S770 E2435 NW 06 11N 1E SL		
Well Id:	0		
First Owner:	GERALD J. AND SANDRA C. ALDER		
Supply Source:	Underground Water Wells (4)		

Map ID Direction Distance Elevation	Database	EDR ID Number
62 **WNW** **1/2 - 1 Mile** **Lower**	**UT WELLS**	**UT6000000149624**

Water Right Num:	25-8987	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Certificated		
Priority Date:	19930805		
Uses:	Irrigation, Other		
Cubic ft/sec:	.015		
Acre ft:	.6		
Location:	S999 W597 N4 36 12N 1W SL		
Well Id:	28337		
First Owner:	CACHE COUNTY CORPORATION		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation		Database	EDR ID Number
P63 **SE** **1/2 - 1 Mile** **Lower**		**FED USGS**	**USGS3044268**

Agency cd:	USGS	Site no:	414345111523501
Site name:	(A-12- 1)31ddc- 1		
Latitude:	414345	EDR Site id:	USGS3044268
Longitude:	1115235	Dec lat:	41.72909698
Dec lon:	-111.8771669	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	SWSESES31 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4429.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1910
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	100	Hole depth:	Not Reported
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1966-08-23	Ground water data end date:	1966-08-23
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1966-08-23		

Note: The site was flowing, but the head could not be measured without additional equipment.

Q64 **SSE** **1/2 - 1 Mile** **Higher**		**UT WELLS**	**UT6000000149080**

Water Right Num:	25-2341	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19120000		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.178		
Acre ft:	0		
Location:	S870 E2470 NW 06 11N 1E SL		
Well Id:	0		
First Owner:	GERALD J. AND SANDRA C. ALDER		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
Q65 **SSE** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149081**

Water Right Num:	25-2341	Exchange:	a21759
Type of right:	Underground		
Status of App:	Approved		
Status:	Appl to Appropriate: Approved		
Priority Date:	19971215		
Uses:	Domestic, Irrigation, Other, Stockwatering		
Cubic ft/sec:	0		
Acre ft:	36.34		
Location:	S870 E2470 NW 06 11N 1E SL		
Well Id:	0		
First Owner:	GERALD J. AND SANDRA C. ALDER		
Supply Source:	Underground Water Wells (4)		

66 **West** **1/2 - 1 Mile** **Lower**	**FED USGS**	**USGS3044145**

Agency cd:	USGS	Site no:	414422111541501
Site name:	(B-12- 1)36bdb- 1		
Latitude:	414422	EDR Site id:	USGS3044145
Longitude:	1115415	Dec lat:	41.73937418
Dec lon:	-111.90494555	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWSENWS 36T 12 NR 1 W
Location map:	WELLSVILLE, UT	Map scale:	24000
Altitude:	4425.		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Valley flat		
Site type:	Ground-water other than Spring	Date construction:	19920212
Date inventoried:	19920212	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Unconfined single aquifer		
Aquifer:	Not Reported		
Well depth:	30.0	Hole depth:	34.5
Source of depth data:	reporting agency (generally USGS)		
Project number:	474920300		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1992-03-02	Ground water data end date:	1992-03-02
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1992-03-02	8.81	

P67
SE
1/2 - 1 Mile
Lower

FED USGS **USGS3044266**

Agency cd:	USGS	Site no:	414344111523301
Site name:	(A-11- 1) 6aab- 1		
Latitude:	414344	EDR Site id:	USGS3044266
Longitude:	1115233	Dec lat:	41.72881922
Dec lon:	-111.87661133	Coor meth:	M
Coor accr:	F	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNENES06 T11N R01E S
Location map:	WELLSVILLE	Map scale:	24000
Altitude:	4430.		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	10		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	19850805
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	230.	Hole depth:	230.
Source of depth data:	logs		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	1989-08-15
Water quality data end date:	1989-08-15	Water quality data count:	1
Ground water data begin date:	0000-00-00	Ground water data end date:	0000-00-00
Ground water data count:	0		

Ground-water levels, Number of Measurements: 0

68
West
1/2 - 1 Mile
Lower

UT WELLS **UT6000000149407**

Water Right Num:	25-4438	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Diligence Claim		
Priority Date:	19340000		
Uses:	Stockwatering		
Cubic ft/sec:	.002		
Acre ft:	0		
Location:	S20 E1720 W4 36 12N 1W SL		
Well Id:	0		
First Owner:	HEBER J. LUNDBERG		
Supply Source:	Underground Water Well		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID Direction Distance Elevation	Database	EDR ID Number
69 **SW** **1/2 - 1 Mile** **Lower**	**UT WELLS**	**UT6000000149196**

Water Right Num:	25-5015	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19200000		
Uses:	Irrigation, Other, Stockwatering		
Cubic ft/sec:	.223		
Acre ft:	0		
Location:	N350 E30 S4 36 12N 1W SL		
Well Id:	0		
First Owner:	JODIE R. AND JEANETTE HARRIS		
Supply Source:	Underground Water Well		

Map ID	Database	EDR ID Number
P70 **SE** **1/2 - 1 Mile** **Lower**	**FED USGS**	**USGS3044265**

Agency cd:	USGS	Site no:	414343111523301
Site name:	(A-11- 1) 6aab- 2		
Latitude:	414343	EDR Site id:	USGS3044265
Longitude:	1115233	Dec lat:	41.72854144
Dec lon:	-111.87661132	Coor meth:	M
Coor accr:	F	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NENENES06 T11N R01E S
Location map:	WELLSVILLE	Map scale:	24000
Altitude:	4430.		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	10		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	Not Reported
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	80.	Hole depth:	80.
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

Map ID Direction Distance Elevation	Database	EDR ID Number
R71 **East** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149429**

Water Right Num:	25-3083	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Certificated		
Priority Date:	19491109		
Uses:	Other		
Cubic ft/sec:	.8		
Acre ft:	0		
Location:	N30 E370 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

Map ID	Database	EDR ID Number
R72 **East** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149424**

Water Right Num:	25-3083	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Certificated		
Priority Date:	19491109		
Uses:	Other		
Cubic ft/sec:	.8		
Acre ft:	0		
Location:	S5 E370 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

Map ID	Database	EDR ID Number
R73 **East** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149408**

Water Right Num:	25-2846	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19300000		
Uses:	Other		
Cubic ft/sec:	.334		
Acre ft:	0		
Location:	S30 E370 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation		Database	EDR ID Number
74 **ENE** **1/2 - 1 Mile** **Higher**		**UT WELLS**	**UT6000000149719**

Water Right Num:	25-5973	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Diligence Claim		
Priority Date:	19340000		
Uses:	Irrigation		
Cubic ft/sec:	1		
Acre ft:	0		
Location:	S195 E110 NW 32 12N 1E SL		
Well Id:	0		
First Owner:	LOGAN COW PASTURE WATER COMPANY		
Supply Source:	Underground Water Drain		

S75 **ESE** **1/2 - 1 Mile** **Higher**		**UT WELLS**	**UT6000000149261**

Water Right Num:	25-6849	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Terminated		
Status:	Appl to Appropriate: Permanently lapsed		
Priority Date:	19760416		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.5		
Acre ft:	0		
Location:	N1125 W120 SE 31 12N 1E SL		
Well Id:	0		
First Owner:	HEBER T. HARDMAN		
Supply Source:	Underground Water Well		

R76 **East** **1/2 - 1 Mile** **Higher**		**UT WELLS**	**UT6000000149425**

Water Right Num:	25-2849	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19280000		
Uses:	Other		
Cubic ft/sec:	.334		
Acre ft:	0		
Location:	S2 E460 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
S77 **ESE** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149269**

Water Right Num:	25-5698	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Diligence Claim		
Priority Date:	19340000		
Uses:	Irrigation		
Cubic ft/sec:	.178		
Acre ft:	0		
Location:	N1160 W10 SE 31 12N 1E SL		
Well Id:	0		
First Owner:	LOUISE R. RICH		
Supply Source:	Underground Water Well		

T78 **SE** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149139**

Water Right Num:	25-7901	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19790222		
Uses:	Domestic, Irrigation, Stockwatering		
Cubic ft/sec:	.015		
Acre ft:	0		
Location:	S260 W1060 NE 06 11N 1E SL		
Well Id:	0		
First Owner:	WILLIAM WORLEY		
Supply Source:	Underground Water Well		

T79 **SE** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149140**

Water Right Num:	25-8704	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19850822		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.005		
Acre ft:	0		
Location:	S260 W1060 NE 06 11N 1E SL		
Well Id:	0		
First Owner:	WILLIAM WORLEY		
Supply Source:	Underground Water Well (Existing)		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID Direction Distance Elevation			Database	EDR ID Number
R80 **East** **1/2 - 1 Mile** **Higher**			**FED USGS**	**USGS3044300**

Agency cd:	USGS	Site no:	414410111521103
Site name:	(A-12- 1)32cbb-14		
Latitude:	414410	EDR Site id:	USGS3044300
Longitude:	1115211	Dec lat:	41.73604133
Dec lon:	-111.87050012	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNWSWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4437.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1930
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	108	Hole depth:	108
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

R81 **East** **1/2 - 1 Mile** **Higher**			**FED USGS**	**USGS3044299**

Agency cd:	USGS	Site no:	414410111521102
Site name:	(A-12- 1)32cbb- 2		
Latitude:	414410	EDR Site id:	USGS3044299
Longitude:	1115211	Dec lat:	41.73604133
Dec lon:	-111.87050012	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNWSWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported

Altitude:	4437.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	Not Reported
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	101	Hole depth:	101
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1967-11-01	Ground water data end date:	1967-11-01
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1967-11-01	-11.00	

R82
East
1/2 - 1 Mile
Higher

FED USGS **USGS3044298**

Agency cd:	USGS	Site no:	414410111521101
Site name:	(A-12- 1)32cbb- 1		
Latitude:	414410	EDR Site id:	USGS3044298
Longitude:	1115211	Dec lat:	41.73604133
Dec lon:	-111.87050012	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNWSWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4437.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	19391128
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	107	Hole depth:	107
Source of depth data:	owner		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00

Peak flow data count:	0	Water quality data begin date:	1961-06-01
Water quality data end date:	1963-02-06	Water quality data count:	4
Ground water data begin date:	1967-11-01	Ground water data end date:	1967-11-01
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1967-11-01	-11.00	

R83
East
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149453**

Water Right Num:	25-3262	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19551010		
Uses:	Other		
Cubic ft/sec:	3.47		
Acre ft:	0		
Location:	N235 E607 W4 32 12N 1E SL		
Well Id:	35588		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

R84
East
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149439**

Water Right Num:	25-3262	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19551010		
Uses:	Other		
Cubic ft/sec:	3.47		
Acre ft:	0		
Location:	N81 E595 W4 32 12N 1E SL		
Well Id:	35587		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

R85
East
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149442**

Water Right Num:	25-3262	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19551010		
Uses:	Other		
Cubic ft/sec:	3.47		
Acre ft:	0		
Location:	N106 E598 W4 32 12N 1E SL		
Well Id:	35586		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

R86
East
1/2 - 1 Mile
Higher

UT WELLS UT6000000149427

Water Right Num:	25-3078	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Certificated		
Priority Date:	19371018		
Uses:	Other		
Cubic ft/sec:	.29		
Acre ft:	0		
Location:	N15 E595 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

U87
WNW
1/2 - 1 Mile
Lower

FED USGS USGS3044158

Agency cd:	USGS	Site no:	414438111541401
Site name:	(B-12- 1)25cdc- 1		
Latitude:	414438	EDR Site id:	USGS3044158
Longitude:	1115414	Dec lat:	41.74381852
Dec lon:	-111.90466782	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	SWSESWS25 T12N R01W S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4424.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	19470718
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	186	Hole depth:	Not Reported
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00

Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1968-11-08	Ground water data end date:	1968-11-08
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1968-11-08	-30.00	

R88
East
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149428**

Water Right Num:	25-2850	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19290000		
Uses:	Other		
Cubic ft/sec:	.39		
Acre ft:	0		
Location:	N15 E615 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

U89
WNW
1/2 - 1 Mile
Lower

UT WELLS **UT6000000149750**

Water Right Num:	25-3152	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: No proof required		
Priority Date:	19470623		
Uses:	Stockwatering		
Cubic ft/sec:	.015		
Acre ft:	0		
Location:	N150 W810 S4 25 12N 1W SL		
Well Id:	0		
First Owner:	CHESTER R. KUNZLER		
Supply Source:	Underground Water Well		

R90
East
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149449**

Water Right Num:	25-2432	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19320700		
Uses:	Irrigation, Other		
Cubic ft/sec:	.156		
Acre ft:	0		
Location:	N160 E640 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

V91
NNE
1/2 - 1 Mile
Higher

UT WELLS UT6000000149905

Water Right Num:	25-5848	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Decree		
Priority Date:	18600501		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	20		
Acre ft:	0		
Location:	S300 W1880 E4 30 12N 1E SL		
Well Id:	0		
First Owner:	EDWIN GOSSNER		
Supply Source:	Underground Water Drain		

V92
NNE
1/2 - 1 Mile
Higher

UT WELLS UT6000000149906

Water Right Num:	25-5849	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Decree		
Priority Date:	18800501		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	20		
Acre ft:	0		
Location:	S300 W1880 E4 30 12N 1E SL		
Well Id:	0		
First Owner:	EDWIN GOSSNER		
Supply Source:	Underground Water Drain		

V93
NNE
1/2 - 1 Mile
Higher

UT WELLS UT6000000149907

Water Right Num:	25-5858	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Decree		
Priority Date:	18600501		
Uses:	Irrigation		
Cubic ft/sec:	20		
Acre ft:	0		
Location:	S300 W1880 E4 30 12N 1E SL		
Well Id:	0		
First Owner:	OSCAR WENNERGREN		
Supply Source:	Underground Water Drain		

R94
East
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149411**

Water Right Num:	25-2851	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	18950000		
Uses:	Other		
Cubic ft/sec:	.056		
Acre ft:	0		
Location:	S26 E640 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

R95
East
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149416**

Water Right Num:	25-2847	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19280000		
Uses:	Other		
Cubic ft/sec:	.497		
Acre ft:	0		
Location:	S17 E642 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

R96
East
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149417**

Water Right Num:	25-2847	Exchange:	a22484
Type of right:	Underground		
Status of App:	Terminated		
Status:	Appl to Appropriate: Withdrawn		
Priority Date:	19980715		
Uses:	Other		
Cubic ft/sec:	.497		
Acre ft:	0		
Location:	S17 E642 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

R97
East
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149406**

Water Right Num:	25-2848	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19290000		
Uses:	Other		
Cubic ft/sec:	.557		
Acre ft:	0		
Location:	S40 E645 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

R98
East
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149398**

Water Right Num:	25-2845	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	19300000		
Uses:	Irrigation, Other		
Cubic ft/sec:	.228		
Acre ft:	0		
Location:	S130 E645 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

R99
East
1/2 - 1 Mile
Higher

FED USGS **USGS3044302**

Agency cd:	USGS	Site no:	414411111520902
Site name:	(A-12- 1)32bcc- 4		
Latitude:	414411	EDR Site id:	USGS3044302
Longitude:	1115209	Dec lat:	41.7363191
Dec lon:	-111.86994455	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	SWSWNWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4438.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1959
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	112	Hole depth:	112
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1959-07-00	Ground water data end date:	1959-07-00
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1959-07	-6.00	

W100
East
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149389**

Water Right Num:	25-3190	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Certificated		
Priority Date:	19511116		
Uses:	Other		
Cubic ft/sec:	.48		
Acre ft:	0		
Location:	S260 E650 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
R101 **East** **1/2 - 1 Mile** **Higher**	**FED USGS**	**USGS3044297**

Agency cd:	USGS	Site no:	414410111520901
Site name:	(A-12- 1)32cbb- 8		
Latitude:	414410	EDR Site id:	USGS3044297
Longitude:	1115209	Dec lat:	41.73604133
Dec lon:	-111.86994455	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNWSWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4438.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1928
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	112	Hole depth:	112
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

X102 **East** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149455**

Water Right Num:	25-3262	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19551010		
Uses:	Other		
Cubic ft/sec:	3.47		
Acre ft:	0		
Location:	N241 E750 W4 32 12N 1E SL		
Well Id:	35589		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation	Database	EDR ID Number
Y103 **West** **1/2 - 1 Mile** **Lower**	**FED USGS**	**USGS3044317**

Agency cd:	USGS	Site no:	414419111542201
Site name:	(B-12- 1)36bca- 1		
Latitude:	414419	EDR Site id:	USGS3044317
Longitude:	1115422	Dec lat:	41.73854085
Dec lon:	-111.90689004	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NESWNWS36 T 12 NR 1 W
Location map:	WELLSVILLE, UT	Map scale:	24000
Altitude:	4425.		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	005		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Valley flat		
Site type:	Ground-water other than Spring	Date construction:	19910910
Date inventoried:	19920213	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Confined multiple aquifers		
Aquifer:	Not Reported		
Well depth:	715.	Hole depth:	1000.
Source of depth data:	driller		
Project number:	474920300		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1992-03-02	Ground water data end date:	1992-03-02
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1992-03-02	-49.13	

Y104 **West** **1/2 - 1 Mile** **Lower**	**FED USGS**	**USGS3044142**

Agency cd:	USGS	Site no:	414420111542201
Site name:	(B-12- 1)36bca- 2		
Latitude:	414420	EDR Site id:	USGS3044142
Longitude:	1115422	Dec lat:	41.73881862
Dec lon:	-111.90689005	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NESWNWS36 T 12 NR 1 W
Location map:	WELLSVILLE, UT	Map scale:	24000
Altitude:	4425.		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Valley flat		
Site type:	Ground-water other than Spring	Date construction:	19920114
Date inventoried:	19920213	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Confined multiple aquifers		
Aquifer:	Not Reported		
Well depth:	986.	Hole depth:	1015.
Source of depth data:	driller		
Project number:	474920300		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1992-01-24	Ground water data end date:	1992-01-24
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1992-01-24	-57.5	

W105
East
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149437**

Water Right Num:	25-2847	Exchange:	a22484
Type of right:	Underground		
Status of App:	Terminated		
Status:	Appl to Appropriate: Withdrawn		
Priority Date:	19980715		
Uses:	Other		
Cubic ft/sec:	.497		
Acre ft:	0		
Location:	N70 E750 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Wells		

Map ID Direction Distance Elevation	Database	EDR ID Number
R106 **East** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000149403**

Water Right Num:	25-3118	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19400417		
Uses:	Domestic, Irrigation, Other		
Cubic ft/sec:	.015		
Acre ft:	0		
Location:	S50 E735 W4 32 12N 1E SL		
Well Id:	0		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

Map ID	Database	EDR ID Number
107 **South** **1/2 - 1 Mile** **Higher**	**UT WELLS**	**UT6000000148955**

Water Right Num:	25-10393	Exchange:	a28494
Type of right:	Underground		
Status of App:	Terminated		
Status:	Appl to Appropriate: Permanently lapsed		
Priority Date:	20031210		
Uses:	Domestic, Stockwatering		
Cubic ft/sec:	0		
Acre ft:	.73		
Location:	S1700 E100 NW 06 11N 1E SL		
Well Id:	0		
First Owner:	JACK L. AND TRUDY BROWN		
Supply Source:	Underground Water Wells (2)		

Map ID	Database	EDR ID Number
X108 **East** **1/2 - 1 Mile** **Higher**	**FED USGS**	**USGS3044305**

Agency cd:	USGS	Site no:	414413111520801
Site name:	(A-12- 1)32bcc- 2		
Latitude:	414413	EDR Site id:	USGS3044305
Longitude:	1115208	Dec lat:	41.73687465
Dec lon:	-111.86966677	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	SWSWNWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported

Altitude:	4438.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	19590812
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	206	Hole depth:	206
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1959-08-12	Ground water data end date:	1959-08-12
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1959-08-12	-12.00	

X109
East
1/2 - 1 Mile
Higher

FED USGS **USGS3044304**

Agency cd:	USGS	Site no:	414412111520801
Site name:	(A-12- 1)32bcc- 1		
Latitude:	414412	EDR Site id:	USGS3044304
Longitude:	1115208	Dec lat:	41.73659688
Dec lon:	-111.86966677	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	SWSWNWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4439.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1932
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	115	Hole depth:	115
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported

Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

W110
East
1/2 - 1 Mile
Higher

FED USGS **USGS3044301**

Agency cd:	USGS	Site no:	414411111520801
Site name:	(A-12- 1)32bcc- 3		
Latitude:	414411	EDR Site id:	USGS3044301
Longitude:	1115208	Dec lat:	41.73631911
Dec lon:	-111.86966677	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	SWSWNWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4438.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	19590619
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	115	Hole depth:	115
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1959-06-19	Ground water data end date:	1959-06-19
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1959-06-19	-6.00	

111
SE
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149143**

Water Right Num:	25-2541	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Underground Water claim		
Priority Date:	1900		
Uses:	Irrigation, Stockwatering		
Cubic ft/sec:	.089		
Acre ft:	9.68		
Location:	S240 E1990 N4 06 11N 1E SL		
Well Id:	0		
First Owner:	OLIVER B. WORLEY		
Supply Source:	Underground Water Well		

W112
East
1/2 - 1 Mile
Higher

FED USGS **USGS3044292**

Agency cd:	USGS	Site no:	414410111520801
Site name:	(A-12- 1)32cbb- 3		
Latitude:	414410	EDR Site id:	USGS3044292
Longitude:	1115208	Dec lat:	41.73604134
Dec lon:	-111.86966676	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNWSWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4439.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1928
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	112	Hole depth:	112
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

W113
East
1/2 - 1 Mile
Higher

FED USGS **USGS3044296**

Agency cd:	USGS	Site no:	414410111520805
Site name:	(A-12- 1)32cbb-13		
Latitude:	414410	EDR Site id:	USGS3044296
Longitude:	1115208	Dec lat:	41.73604134
Dec lon:	-111.86966676	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNWSWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4439.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1930
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	139	Hole depth:	139
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

W114
East
1/2 - 1 Mile
Higher

FED USGS **USGS3044294**

Agency cd:	USGS	Site no:	414410111520803
Site name:	(A-12- 1)32cbb- 5		
Latitude:	414410	EDR Site id:	USGS3044294
Longitude:	1115208	Dec lat:	41.73604134
Dec lon:	-111.86966676	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNWSWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4439.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1929
Date inventoried:	Not Reported	Mean greenwich time offset:	MST

Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	111	Hole depth:	111
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

W115
East
1/2 - 1 Mile
Higher

FED USGS **USGS3044295**

Agency cd:	USGS	Site no:	414410111520804
Site name:	(A-12- 1)32cbb- 7		
Latitude:	414410	EDR Site id:	USGS3044295
Longitude:	1115208	Dec lat:	41.73604134
Dec lon:	-111.86966676	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNWSWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4439.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1938
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	150	Hole depth:	150
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1938-05-00	Ground water data end date:	1938-05-00
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1938-05	-22.00	

W116
East
1/2 - 1 Mile
Higher

FED USGS USGS3044293

Agency cd:	USGS	Site no:	414410111520802
Site name:	(A-12- 1)32cbb- 4		
Latitude:	414410	EDR Site id:	USGS3044293
Longitude:	1115208	Dec lat:	41.73604134
Dec lon:	-111.86966676	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNWSWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4439.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1929
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	108	Hole depth:	108
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

W117
East
1/2 - 1 Mile
Higher

FED USGS USGS3044287

Agency cd:	USGS	Site no:	414409111520801
Site name:	(A-12- 1)32cbb-12		
Latitude:	414409	EDR Site id:	USGS3044287
Longitude:	1115208	Dec lat:	41.73576357
Dec lon:	-111.86966676	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	NWNWSWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4437.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1944
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	106	Hole depth:	106
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1944-05-00	Ground water data end date:	1944-05-00
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1944-05	-22.00	

W118
East
1/2 - 1 Mile
Higher

UT WELLS **UT6000000149431**

Water Right Num:	25-3262	Exchange:	Not Reported
Type of right:	Underground		
Status of App:	Perfected		
Status:	Appl to Appropriate: Water users claim signed		
Priority Date:	19551010		
Uses:	Other		
Cubic ft/sec:	3.47		
Acre ft:	0		
Location:	N30 E834 W4 32 12N 1E SL		
Well Id:	31603		
First Owner:	STATE OF UTAH DIVISION OF WILDLIFE RESOURCES		
Supply Source:	Underground Water Well		

Map ID Direction Distance Elevation		Database	EDR ID Number
X119 **East** **1/2 - 1 Mile** **Higher**		**FED USGS**	**USGS3044311**

Agency cd:	USGS	Site no:	414416111520601
Site name:	(A-12- 1)32bcd- 2		
Latitude:	414416	EDR Site id:	USGS3044311
Longitude:	1115206	Dec lat:	41.73770797
Dec lon:	-111.86911121	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	SESWNWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported
Altitude:	4438.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1961
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	265	Hole depth:	265
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

X120 **East** **1/2 - 1 Mile** **Higher**		**FED USGS**	**USGS3044308**

Agency cd:	USGS	Site no:	414414111520601
Site name:	(A-12- 1)32bcd- 3		
Latitude:	414414	EDR Site id:	USGS3044308
Longitude:	1115206	Dec lat:	41.73715243
Dec lon:	-111.8691112	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	49
State:	49	County:	005
Country:	US	Land net:	SESWNWS32 T12N R01E S
Location map:	Not Reported	Map scale:	Not Reported

Altitude:	4438.00		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	5.		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Little BearLogan. Idaho, Utah. Area = 928 sq.mi.		
Topographic:	Flat surface		
Site type:	Ground-water other than Spring	Date construction:	1959
Date inventoried:	Not Reported	Mean greenwich time offset:	MST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	200	Hole depth:	200
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1959-09-00	Ground water data end date:	1959-09-00
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1959-09	-12.00	

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS
RADON

AREA RADON INFORMATION

State Database: UT Radon

Radon Test Results

Zipcode	Maximum	Average	Num Tests	Test Term
84321	5.9	2.7	12	Long Term
84321	82.4	5.3	263	Short Term

Federal EPA Radon Zone for CACHE County: 2

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for CACHE COUNTY, UT

Number of sites tested: 1

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	0.300 pCi/L	100%	0%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	Not Reported	Not Reported	Not Reported	Not Reported

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

Scanned Digital USGS 7.5' Topographic Map (DRG)
Source: United States Geologic Survey
A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey topographic map. The map images are made by scanning published paper maps on high-resolution scanners. The raster image is georeferenced and fit to the Universal Transverse Mercator (UTM) projection.

HYDROLOGIC INFORMATION

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 and 2005 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetlands in Utah
Source: Automated Geographic Reference Center
Telephone: 801-537-9201

HYDROGEOLOGIC INFORMATION

AQUIFLOW^R Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services
The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services (NRCS)
Telephone: 800-672-5559
SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Services, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

LOCAL / REGIONAL WATER AGENCY RECORDS

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

STATE RECORDS

Water Rights Database
Source: Department of Natural Resources, Division of Water Rights
Telephone: 801-538-7408

OTHER STATE DATABASE INFORMATION

Utah Oil, Gas and Mining Database
Source: Department of Natural Resources
Telephone: 801-538-5340
The Well Data file contains one record of basic information for each well in the Utah Division of Oil, Gas and Mining database.

RADON

State Database: UT Radon
Source: Department of Environmental Quality
Telephone: 801-536-4250
Test Results by Zip Code

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

PHYSICAL SETTING SOURCE RECORDS SEARCHED

STREET AND ADDRESS INFORMATION

Logan Phase I ESA
2400 West 200 North
Logan, UT 84321

Inquiry Number: 3407549.4
September 10, 2012

Certified Sanborn® Map Report

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
800.352.0050
www.edrnet.com

Certified Sanborn® Map Report

9/10/12

Site Name:
Logan Phase I ESA
2400 West 200 North
Logan, UT 84321

EDR Inquiry # 3407549.4

Client Name:
IGES
4153 South Commerce Drive
Salt Lake City, UT 84107

Contact: David Petersen

EDR® Environmental Data Resources Inc

The complete Sanborn Library collection has been searched by EDR, and fire insurance maps covering the target property location provided by IGES were identified for the years listed below. The certified Sanborn Library search results in this report can be authenticated by visiting www.edrnet.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by Sanborn Library LLC, the copyright holder for the collection.

Certified Sanborn Results:

Site Name:	Logan Phase I ESA
Address:	2400 West 200 North
City, State, Zip:	Logan, UT 84321
Cross Street:	
P.O. #	00823-011
Project:	Logan Phase I ESA
Certification #	E6DB-4420-B5BC

UNMAPPED PROPERTY

This report certifies that the complete holdings of the Sanborn Library, LLC collection have been searched based on client supplied target property information, and fire insurance maps covering the target property were not found.

Sanborn® Library search results
Certification # E6DB-4420-B5BC

The Sanborn Library includes more than 1.2 million Sanborn fire insurance maps, which track historical property usage in approximately 12,000 American cities and towns. Collections searched:

- ✔ Library of Congress
- ✔ University Publications of America
- ✔ EDR Private Collection

The Sanborn Library LLC Since 1866™

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Logan Phase I ESA
2400 West 200 North
Logan, UT 84321

Inquiry Number: 3407549.3
September 12, 2012

The EDR Aerial Photo Decade Package

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
800.352.0050
www.edrnet.com

EDR Aerial Photo Decade Package

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

When delivered electronically by EDR, the aerial photo images included with this report are for ONE TIME USE ONLY. Further reproduction of these aerial photo images is prohibited without permission from EDR. For more information contact your EDR Account Executive.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Date EDR Searched Historical Sources:

Aerial Photography September 12, 2012

Target Property:

2400 West 200 North

Logan, UT 84321

Year	***Scale***	***Details***	***Source***
1953	Aerial Photograph. Scale: 1"=1000'	Panel #: 41111-F8, Wellsville, UT;/Flight Date: June 09, 1953	EDR
1976	Aerial Photograph. Scale: 1"=1000'	Panel #: 41111-F8, Wellsville, UT;/Flight Date: August 25, 1976	EDR
1981	Aerial Photograph. Scale: 1"=1000'	Panel #: 41111-F8, Wellsville, UT;/Flight Date: September 01, 1981	EDR
1987	Aerial Photograph. Scale: 1"=750'	Panel #: 41111-F8, Wellsville, UT;/Flight Date: July 24, 1987	EDR
1993	Aerial Photograph. Scale: 1"=750'	Panel #: 41111-F8, Wellsville, UT;/Flight Date: August 14, 1993	EDR
1997	Aerial Photograph. Scale: 1"=750'	Panel #: 41111-F8, Wellsville, UT;/Flight Date: October 04, 1997	EDR


INQUIRY #: 3407549.3
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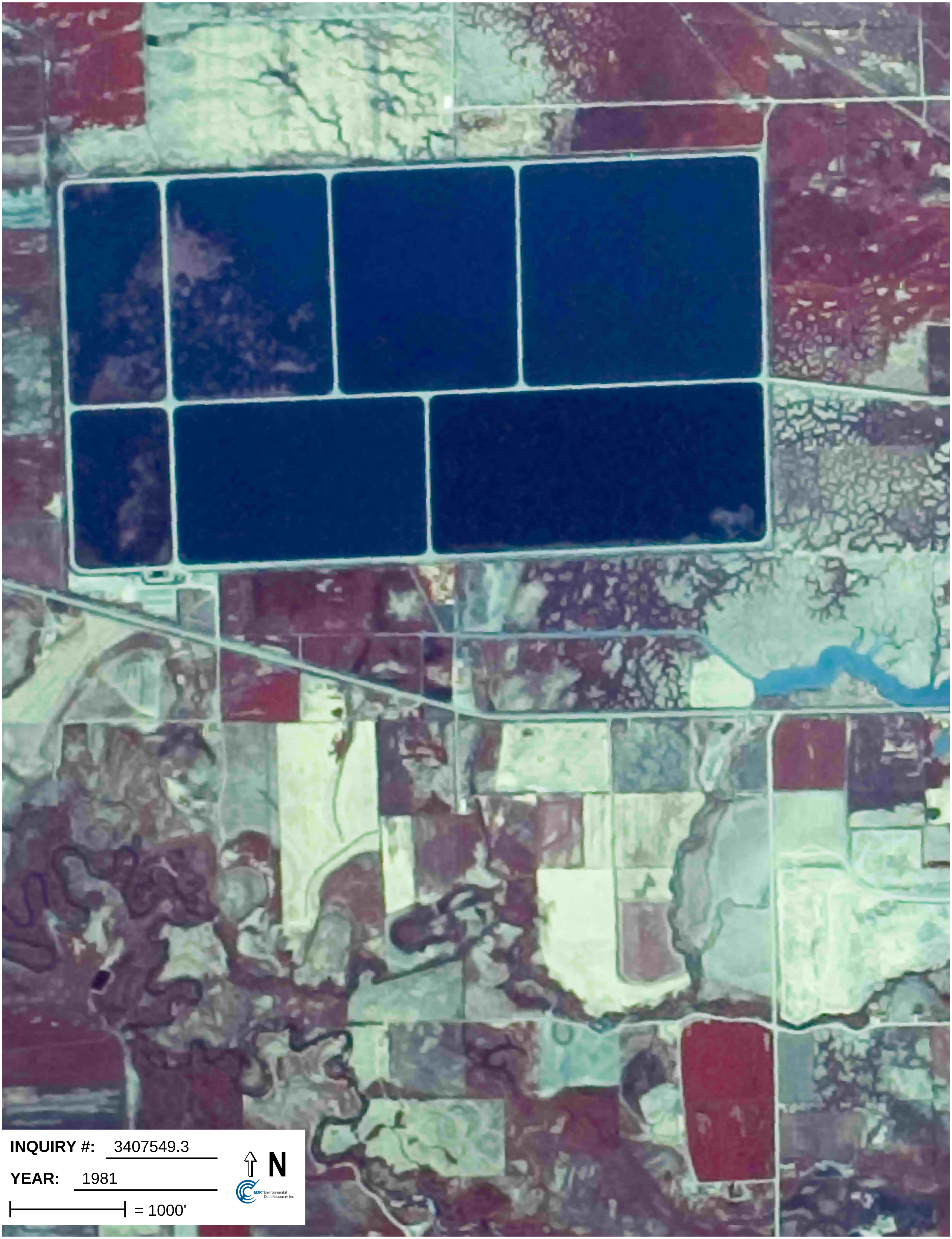
EDR Environmental Data Resources Inc
= 1000'


INQUIRY #: 3407549.3
YEAR: 1976
= 1000'
N
EDR Environmental Data Resources Inc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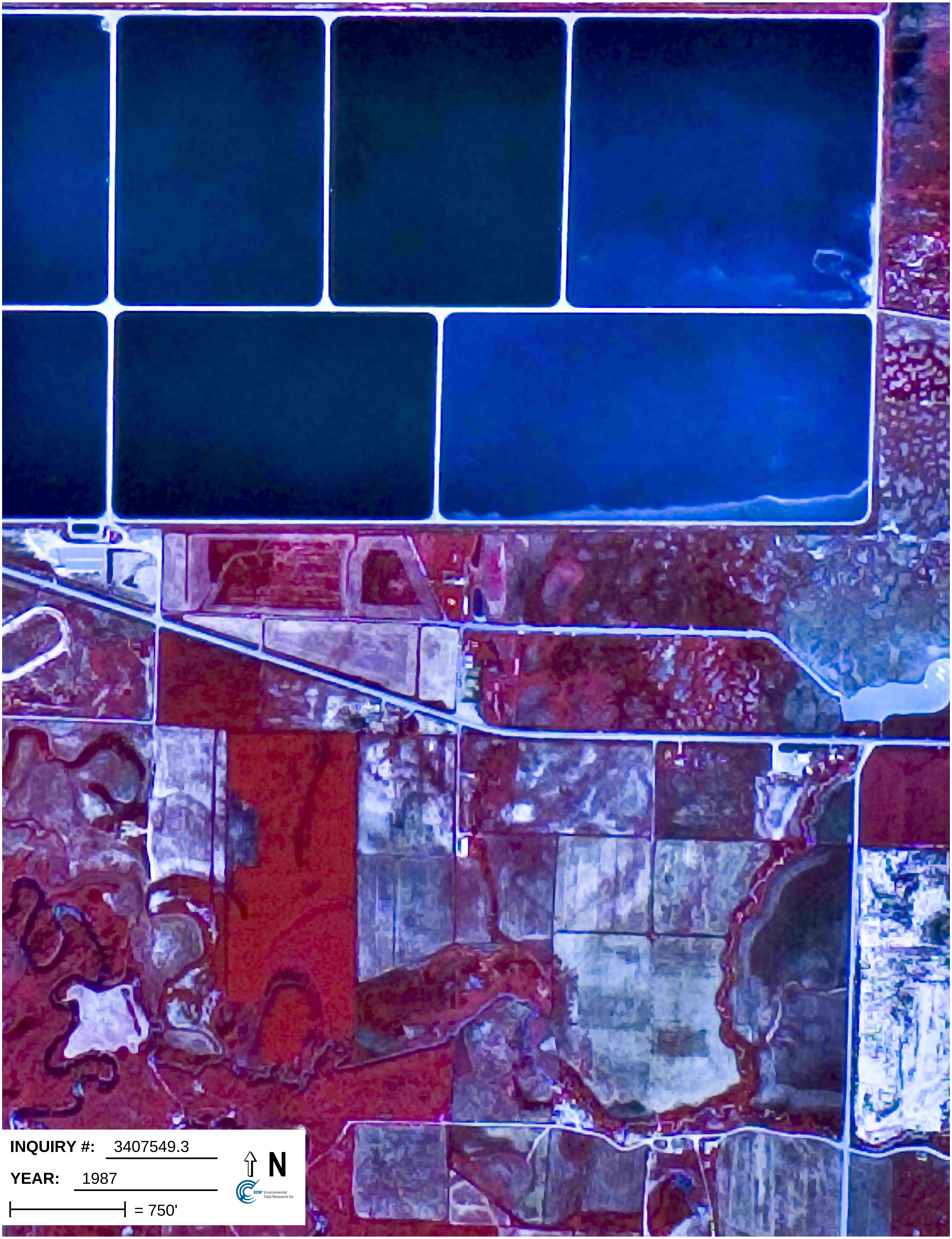
EDR Environmental Data Resources Inc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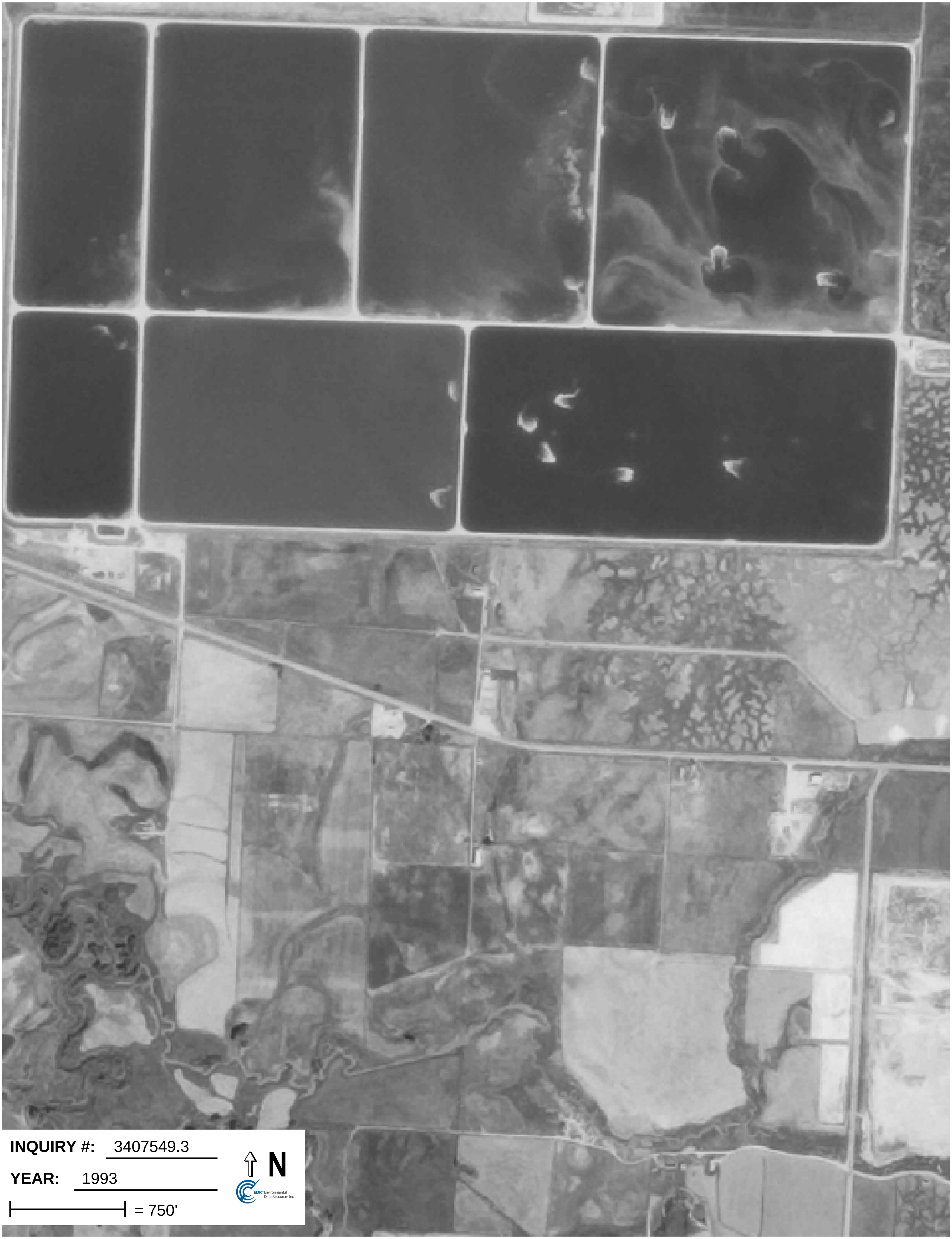
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YEAR: 1993
= 750'
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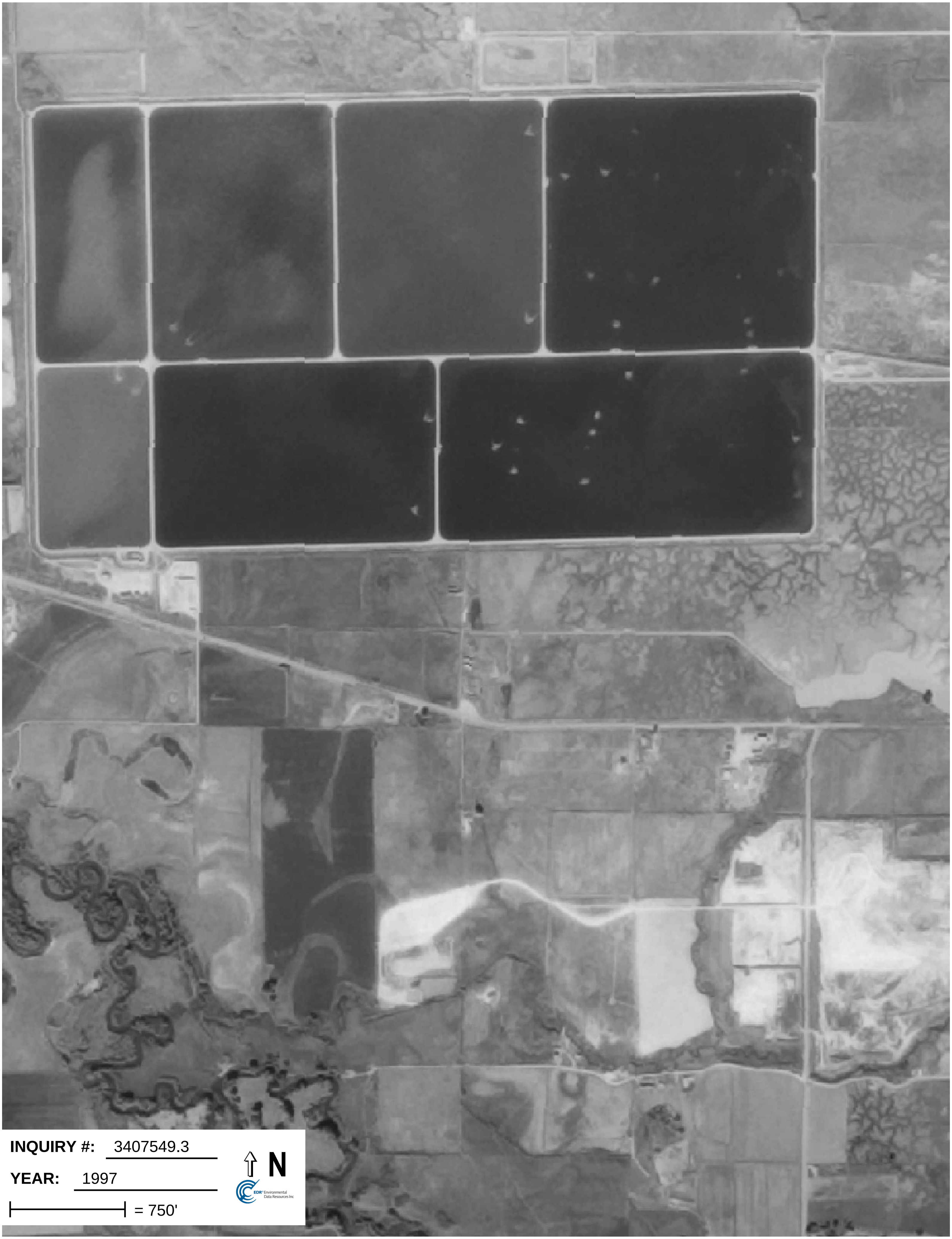
EDR Environmental Data Resources Inc



INQUIRY #: 3407549.3

YEAR: 1997

= 750'

N

User Questionnaire

APPENDIX E

Intermountain GeoEnvironmental Services, Inc.
4153 South 300 West Salt Lake City, Utah 84107
Phone (801) 270-9400 ~ F: (801) 270-9401
www.igesinc.com

GEOTECHNICAL INVESTIGATION
Logan Wastewater Treatment Plant Improvement Project
2600 West 200 North
Logan, Utah

IGES Job No. 00823-012

May 22, 2014

Prepared for:

Carollo Engineers

IGES®
Intermountain GeoEnvironmental Services, Inc.
4153 South 300 West, Salt Lake City, Utah 84107 ~ T: (801) 270-9400 ~ F: (801) 270-9401

Prepared for:

Carollo Engineers
1265 East Fort Union Blvd, Suite 200
Midvale, UT 84047
Attn: Mr. Clint Rodgers., P.E.

Geotechnical Investigation
Wastewater Treatment Plant Improvements Project
2600 West 200 North
Logan, Utah

IGES Job No. 00823-012

Prepared by:

Joan Green, P.E.I.
Staff Engineer

Davey Breinholt, P.E.
Project Engineer

PROFESSIONAL ENGINEER
374860
05/22/2014
JARED A.
HAWES
ELECTRONIC SEAL
STATE OF UTAH

Jared Hawes, P.E.
Project Manager

IGES, Inc.
4153 South 300 West
Salt Lake City, Utah 84107
(801) 270-9400

May 22, 2014

TABLE OF CONTENTS

APPENDICES

1.0 EXECUTIVE SUMMARY

This report presents the results of a geotechnical investigation conducted for the proposed improvements to the Logan Water Treatment Plant west of Logan, Utah. The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the site and to provide general recommendations for site grading, excavation support and the design and construction of foundations for new buildings, tanks (digesters) utility lines connecting the improvements.

The subsurface soil conditions were explored at the west portion of the subject property by advancing eight borings across the proposed construction areas; two CPT soundings were also completed. The location of the borings and CPT soundings are shown on Plate A-1 in Appendix A. Subsurface soil conditions were logged during our field investigation and are presented on the boring logs and CPT logs presented on (Plates A-2 through A-9 and A-11 through A-12) of Appendix A. The subsurface conditions encountered during our investigation are discussed below. After completion of our initial investigation it was determined that the initial construction footprint will extend farther east than originally anticipated. While we did not encounter dramatically different conditions in our explorations, it is our recommendation that prior to construction additional exploration and testing be performed in the expanded construction area to confirm subsurface conditions and determine if modifications to our recommendations are necessary.

Based on our observations and geologic literature review, the site is underlain by Late Quarternary-aged lacustrine silt and clay deposited by Lake Bonneville (Barker & Barker, 1993). It is estimated that the upper 30 feet of the soil in the explorations consists of fine-grained silts and clays. Low blow counts, high measured moisture contents and dry densities within this soil also indicate that soft CLAY is highly compressible. Below 30 feet the soil profile begins to include some sandy layers from 1 to 11 ft thick

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for the proposed development provided that the recommendations contained in this report are incorporated into the design and construction of the project. In recent discussions Carollo has expressed their plan to add several feet of fill to the site in order to avoid shallow groundwater during initial construction, long term operation as well as future plant expansions. In order to allow the plant to operate without excessive pumping it is our understanding that the proposed structures will be at least partially if not fully buried within imported fill that is placed above the existing grade. This fill may be as large as 10 ft above existing grade and will be placed and compacted around the structures to allow for site access. To allow for gravity flow to the facility, the Headworks building will be constructed below the existing grade then evacuated by pumping up into the other treatment works.

New construction and fill placed above the current site grade would induce new loads and result in consolidation settlement of native soils. Settlement could be mitigated through preloading of the site as well as careful coordination of earthwork and other construction activities; however, in consideration of the time required and potential for interruption of the required construction schedule it is our recommendation that a deep foundation system be utilized for support of all structures and pipe runs. The planned placement of fill surrounding and between structures after construction would also induce settlement that may be difficult to account for in setting pipe elevations for future connection. Design loads for proposed facilities were not prepared at the time of this report. Based on our understanding of proposed construction a conceptual design for driven piles to support structures is presented later in this report.

If the structures are founded on shallow foundations above grade, loading will be new to the soft and compressible native soils. In this report IGES has also evaluated settlement associated with this increased surface load and structures supported by conventional, shallow foundations. Based on the measured consolidation properties of soil at the site and the quantity of fill anticipated we have calculated anticipated settlement under pre construction fill (12 feet high) will reach approximately 34 inches. If the site is preloaded, settlement should be substantially complete in approximately 520 days. Depending on the elevation of conventional foundations and the actual structural loads, post-construction settlement up to 8 inches is possible.

We recommend that IGES inspect the bottom of the foundation excavation prior to the placement of structural fill, reinforcing steel or concrete in order to identify any unsuitable soils and to observe/document the quality of fill placement. All fill beneath the foundations should be placed and compacted in accordance with our recommendations contained in Section 6.2.6 of this report

NOTE: The scope of services provided within this report are limited to the assessment of the subsurface conditions at the subject site. The executive summary is provided solely for purposes of overview and is not intended to replace the report of which it is part and should not be used separately from the report.

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a geotechnical investigation conducted for the proposed improvements to the Logan Water Treatment Plant west of Logan, Utah. The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the site and to provide general recommendations for site grading, excavation support and the design and construction of foundations for new buildings, tanks (digesters), and utility lines connecting the improvements.

The scope of work completed for this study included a site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analyses, and preparation of this report. Our services were performed in accordance with our proposal and signed authorization to proceed, dated January 23, 2013.

The recommendations contained in this report are subject to the limitations presented in the "Limitations" section of this report (Section 7.1).

2.2 PROJECT UNDERSTANDING AND DESCRIPTION

The subject property is located at 4252 West 2200 South, west of Logan, Utah. The property is bounded on the south by 600 North, on the north by the existing sewer lagoons, on the east by undeveloped land and to the west by the police shooting range and buildings associated with the lagoon operations.

We understand that preliminary plans for the Logan Wastewater Treatment Plant consisted of multiple phases of construction. The initial phase is to include at least six clarifiers, a tertiary treatment building, headworks building, and three bioreactors. Utilities will also be installed to each of the new structures. Future planned phases include additional bioreactors, clarifiers and other tanks and structures that will be located to the east of the earlier phase. Depending on costs, some of these additional treatment features may be included in the initial construction.

The clarifiers will be approximately 75 foot diameter tanks that were assumed to be approximately 18 feet tall. It was assumed that the tanks would be constructed out of concrete. They will be used to store and process waste water with an approximate unit weight of water (62.4 pcf). The Bioreactors will be approximately 300 feet long, 75 feet wide, and were assumed to be approximately 18 feet tall. The Bioreactor will be constructed using concrete and will be used to store and treat solid waste in solution near to the approximate unit weight of water.

After completion of our field work and subsequent discussions with Carollo it has been determined that most of the proposed structures will be constructed within five feet of the existing grade, and will be placed on a relatively thin layer of compacted fill. Additional fill up to 10 ft in height will be placed around the structures once construction is completed. The one exception will be the headworks building, which must be located below grade to allow for gravity flow of waste water entering the facility. Any structures or fill placed above existing grade will apply "new" loads to the soft and compressible native soils. In this report IGES will evaluate settlement associated with the anticipated increase to surface loads as well as options for supporting the structures on a deep foundation system or pre-loading the site to meet different construction schedules.

The clarifiers and bioreactors will typically have about 15 ft of liquid in them and will be full the majority of the time. We anticipate they will be emptied occasionally for regular cleaning/maintenance. Rebounding of soils associated with the periodic unloading of the structures will also be evaluated in this report.

3.0 METHODS OF STUDY

3.1 FIELD INVESTIGATION

As a part of this investigation, near surface soil conditions were explored by drilling eight boreholes and performing two Cone Penetration Test (CPT) soundings throughout the proposed 1st phase of the improvements. A member of our technical staff visually logged the soil in the borings at the time of excavation in general accordance with the Unified Soil Classification System (USCS). The boring depths varied from approximately 50.5 feet to 71.5 feet below the existing site grade. CPT Soundings in CPT-01 and CPT-02 extended to 100 and 50 feet below site grade, respectively. The approximate locations of each exploration are shown on Plate A-1 *Site Map.* The boring logs are included at the end of this report (Plates A-2 thru A-9). A *Key to Soil Symbols and Terminology* is provided on Plate A-10. Continuous CPT logs are presented on Plates A-11 and A-12 and a discussion of the site conditions encountered in these explorations is provided in Section 4.0 of this report.

The borings were advanced with a CME 85 track mounted drill rig. Representative soil samples were collected and visually classified by a member of our technical staff. Disturbed soil samples were collected using a Standard Penetration Test (SPT) split spoon sampler and placed into bags. Relatively undisturbed samples were obtained using the Dames and Moore "U" sampler and Shelby tubes. The samples were carefully packaged and transported to our laboratory for appropriate testing.

3.2 LABORATORY INVESTIGATION

Geotechnical laboratory tests were conducted on selected relatively undisturbed and bulk soil samples obtained during our field investigation. The laboratory testing program was designed to evaluate the engineering characteristics of onsite earth materials. Laboratory tests conducted during this investigation included:

- In situ moisture content and dry density
- Atterberg Limits
- Grain Size Distribution (Sieve)
- Consolidation (One-Dimensional, Time Rate and Constant Rate of Strain)
- Strength testing (Direct Shear, Triaxial-Unconsolidated Undrained)

Results of the in situ dry density, moisture content, and Atterberg limits tests are shown on the boring logs Appendix A (Plates A-2 through A-9). The results of remaining laboratory tests are presented on the Summary of Laboratory Test Results Table and test result plates presented in Appendix B

3.3 ENGINEERING ANALYSIS

Engineering analyses were performed using data obtained from field investigations and the laboratory testing. Appropriate factors of safety have been applied to the analyses performed, consistent with industry standards and the accepted standard of care.

4.0 GENERALIZED SITE CONDITIONS

4.1 SURFACE CONDITIONS

At the time of our field investigation, the majority of the proposed locations for the improvements of the Logan Water Treatment Plant were in undeveloped areas. An existing police shooting range was located on the west side of the proposed construction. The property contained one structure associated to the shooting range. Also, some embankments were located within the shooting range boundaries. Overall the site sloped slightly to the west.

4.2 SUBSURFACE CONDITIONS

The subsurface soil conditions were explored at the subject property by advancing eight borings across the proposed construction area, two CPT soundings were also completed. Subsurface soil conditions were logged during our field investigation and are included in the boring logs and CPT logs are in Appendix A at the end of this report (Plates A-2 through A-9 and A-11 through A-12). The conditions encountered during our investigation are discussed below.

4.2.1 Earth Materials

The existing police shooting range which is located on the west side of the project site was explored by advancing borings B-01 and B-02. This area contained approximately 4 feet of imported fill directly underlain by a medium stiff Fat CLAY to approximately 9 feet below grade at the time of our investigation. Below the Fat CLAY a medium stiff Lean CLAY extends to approximately 19 feet. A soft Fat CLAY layer is located below the Lean CLAY and extends to approximately 39 feet. Below the soft Fat CLAY layer a variation of Lean CLAY and SAND extends to the bottom of the explorations. Preliminary plant design included placement of the headworks and tertiary treatment buildings on the western portions of the shooting range area. These plans have since been modified, and those buildings will be located further to the east.

The remaining borings were located in a field located on the east side of the shooting range. In this area a thin layer of topsoil was observed to be approximately 6 to 24 inches thick. Generally underlying the topsoil, a layer of stiff Lean to Fat CLAY extending to approximately 19 feet below the ground surface was observed. Below the stiff CLAY a soft layer of CLAY was observed from approximately 19 feet to 29 feet. Below the soft CLAY a stiff layer of CLAY was observed to extend to approximately 34 feet below site grade where SILT and SAND were observed to the end of the explorations.

Based on the results of our investigations the silt and sand layer appears to be in place at a relatively consistent elevation below grade across the site.

The stratification lines shown on the enclosed boring logs represent the approximate boundary between soil types (Plates A-2 through A-9). The actual in-situ transition may be gradual and vary laterally based on depositional environment and, in some cases, seismic activity. Due to the nature and depositional characteristics of the native soil, care should be taken in interpolating subsurface conditions between or extrapolating conditions beyond the exploration locations.

4.2.2 Groundwater/Moisture Conditions

Groundwater was observed in most of the subsurface investigations. However, due to the drilling methods used (rotary wash) to advance the borings most measurements of the groundwater could not be accurately taken at the time of our investigation. To better determine the depth to groundwater multiple pore pressure dissipation tests were performed in the two CPT explorations. Based on the measurement taken in B-1, the groundwater table was measured/estimated to be approximately 13 feet below the existing ground surface at that location. The CPT pore pressure dissipation tests indicate that artisan water pressure would be expected at depths greater than 65 feet below the ground surface. However, at depths of approximately 30 feet below the ground surface, the groundwater level would be approximately 5 feet.

A single piezometer was installed in Boring B-12, near the center of proposed construction. Subsequent measurements taken by Logan City personnel have indicated that groundwater is approximately 4.5 to 5 feet below grade.

It is our experience that during snowmelt, runoff, irrigation on surrounding properties, high precipitation events, and other activities, the groundwater level can fluctuate several feet. It is our understanding that the groundwater elevation may rise to very near the existing grade and may be influenced somewhat by existing Logan Sewer Treatment Ponds;

therefore the area and may experience minimal fluctuation from the natural climactic variables mentioned above.

5.0 GEOLOGIC CONDITIONS

5.1 GEOLOGIC SETTING

5.1.1 Regional Geology

Cache Valley is in the northeast corner of the Basin and Range physiographic province Cache Valley is a graben bounded on the east and west by high angle normal faults. On the west side, the West Cache Fault is expressed at the foot of the Wellsville Mountains, and the East Cache Fault is located at the foot of the Bear River Range on the east. The West Cache Fault (commonly referred to as the Wellsville Fault: Williams, 1948, 1958, 1962; Beer, 1967; Bjorklund and McGreevy, 1971) runs roughly northwest-southeast, is located immediately east and at the foot of the Wellsville Mountains and is down-thrown to the east.

5.1.2 Local Geology

The area in and around the site is underlain by fine-grained, low-permeability lacustrine soil with generally high plasticity. Thicker sandy layers are present at depths below about 30 feet. There are no known faults, unstable slopes, or subsidence areas in the vicinity of the proposed water treatment plant.

Surface sediments at the site are mapped as Lacustrine Silt and Clay of the Lake Bonneville Alloformation (Qli). These silts and clays are the most extensive sediments of the Lake Bonneville Alloformation in the Cache Valley. They are mainly found in the valley at a lower elevation than the Lake Bonneville Alloformation gravel. They represent suspended sediments that settled from the lake water onto the lake bottom. Outcrops of these sediments are restricted mainly to the banks of the Little Bear River, Logan River and their tributaries. Along the eastern edge of the Lake Bonneville Alloformation gravel the clays onlap and interfinger with the Lake Bonneville sand and gravel. (Barker and Barker, 1993).

The site is located in the northern portion of the area mapped by Barker and Barker (1993); in this area the groundwater table is reported to be almost at the surface. Bjorklund and McGreevy (1971) mention that the high water level impedes the downward movement of water applied to the surface, thereby increasing the waterlogged condition. This effects the Qli sediments in the valley along the little bear River, the Logan River and their tributaries.

Based on site investigations, shallow soil in underlying the site consists of fine-grained clay with occasional fine sand layers. When these sandy layers contain groundwater, they are considered part of the shallow water-bearing zone, as discussed in the following section on hydrogeologic conditions. Geotechnical analyses indicate that the shallow clays are highly plastic and generally classify as CH, which is considered an inorganic clay of high plasticity (fat clay), according to the Unified Soil Classification System (USCS). Vertical permeabilities are low, ranging from $6x10^{-7}$ to $4x10^{-8}$ cm/sec. Based on the laboratory testing the natural moisture content of these soils ranges from 18 to 76 dry unit weights vary from 58 to 113 pcf. Geotechnical laboratory test data is included on the attached boring logs in Appendix A (A-2 through A-9) and in Appendix B.

5.2 SEISMICITY AND FAULTING

Review of available fault mapping indicates that there are no known active faults that pass under or immediately adjacent to the site. The site is located approximately 5.4 miles west of the central section of the East Cache fault zone and 4.2 miles east of the junction Hills fault of the West Cache fault zone (USGS, 2013). The East Cache fault zone has three sections which are differentiated based and fault zone complexity, tectonic geomorphology and expression of the surface fault scarps. The central section of the fault is the most active of the three in the latest quaternary, the northern and southern sections are less active and shown evidence of only middle to late Pleistocene activity (Black et al, 1999).

Seismic hazard maps depicting probabilistic ground motions and spectral response have been developed for the United States by the U. S. Geological Survey as part of NEHRP/NSHMP (Frankel et al., 1996). These maps have been incorporated into both *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* (FEMA, 1997) and the *International Building Code* (IBC) (International Code Council, 2012). Spectral responses for the Maximum Considered Earthquake (MCE) are shown in the table below. These values generally correspond to a two percent probability of exceedance in 50 years (2PE50) for a “firm rock” site. To account for site effects, site coefficients which vary with the magnitude of spectral acceleration are used. Based on boring explorations and measurements of shear wave velocities (ConeTec, 2013) it is our opinion that this location is best described as a Site Class E (soft soil profile). The spectral accelerations are shown in the table below. The spectral accelerations are calculated based on the site's approximate latitude and longitude of 41.738244˚N and -111.897002˚W, respectively. Based on IBC, the site coefficients are F_a=0.90 and F_v= 2.63. From this procedure the peak ground acceleration (PGA) is estimated to be 0.365 g. The MCE PGA and Design response spectrum are presented in Appendix C on Plate C-1.

MCE Seismic Response Spectrum Spectral Acceleration Values for IBC Site Class E [a]			
Site Location: Lat. 41.738244ºN Long. -111.897002ºW			
Spectral Period (sec)	**Mapped Spectral Acceleration Values (g) (Site Class B)**	**Site Coefficients: (Site Class E)**	**Mapped Response Spectral Acceleration (g)[a]**
0.2	S_S = 1.014	Fa = 0.90	S_{MS}=(S_S x Fa) = 0.913
1.0	S_1 = 0.318	Fv = 2.63	S_{M1}=(S_1 x Fv) = 0.868
[a] IBC 1615.1.3 recommends reducing the mapped values by 1/3 to obtain the design spectral response acceleration values.			

5.3 OTHER GEOLOGIC HAZARDS

Geologic hazards can be defined as naturally occurring geologic conditions or processes that could present a danger to human life and property. We assume that geologic hazards were considered during initial development of the existing sewage lagoons, and that the location of the proposed facility will not be altered to avoid additional hazards if present. Additional assessment of all potential gelogic hazards was not considered necessary for this report. However, in addition to seismicity the other identified geologic hazard considered for this site is liquefaction.

5.3.1 Liquefaction

Certain areas within the intermountain region possess a potential for liquefaction during seismic events. Liquefaction is a phenomenon whereby loose, saturated, granular soil deposits lose a significant portion of their shear strength due to excess pore water pressure buildup resulting from dynamic loading, such as that caused by an earthquake. Among other effects, liquefaction can result in densification of such deposits causing settlements of overlying layers after an earthquake as excess pore water pressures are dissipated. The primary factors affecting liquefaction potential of a soil deposit are: (1) level and duration of seismic ground motions; (2) soil type and consistency; and (3) depth to groundwater.

Referring to the “Liquifacation Potential Map for Cache Valley, Cache County, Utah” map published by the Utah Geological Survey (UGS, 2003), the site is located within an area designated as "low" for liquefaction potential. Other mapping of the area (Solomon et al, 2001) designates the site as having "moderate" liquefaction potential. Based on the field data collected for this site we would classify the site as having moderate potential for liquefaction. According to Solomon, liquefaction was not documented in "moderate" zones during the 1962 Cache Valley Earthquake even though ground water is shallow and loose granular deposits do exist at depths below 30-35 feet in these areas. The predominant sediments encountered consist of fine-grained, high plasticity soils which are not susceptible to liquefaction. With few exceptions, the relatively thin layers containing granular deposits typically contained a significant portion of fine-grained soils as well.

6.0 ENGINEERING CONCLUSIONS AND RECOMMENDATIONS

6.1 GENERAL CONCLUSIONS

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for the proposed development, provided that the recommendations contained in this report are incorporated into the design and construction of the project.

The majority of soils encountered at the site consist of highly compressible clays. Settlement of these soils is the main geotechnical concern associated with the proposed project. In order to minimize the impacts of groundwater during both construction and long term maintenance of the facility Carollo has informed us of their intent to build most new facilities above the current site grade on imported fill, additional fill height is also desired around planned structures for access. As mentioned previously it is also likely that the treatment plant will be expanded to meet the future needs of a growing population. Along with planning for hydraulic operations of the expanded plant, earthwork associated with initial construction must take into consideration the construction of future facilities.

New construction and fill placed above the current site would induce new loads and result in consolidation settlement of native soils. Settlement could be mitigated through preloading of the site as well as careful coordination of earthwork and other construction activities; however, in consideration of the time required and potential for interruption of the required construction schedule it is our recommendation that a deep foundation system be utilized for support of all structures and pipe runs. The planned placement of fill surrounding and between structures after construction would also induce settlement that may be difficult to account for in setting pipe elevations for future connection. Design loads for proposed facilities were not prepared at the time of this report. Based on our understanding of proposed construction a conceptual design for driven piles to support structures is presented later in this report.

It is possible that variations in soil stratigraphy exist between and beyond points explored. Based on recent discussions with Carollo, the site layout has been modified somewhat to extend the first phase of construction further east of the area initially explored. It is our recommendation that additional subsurface investigation be performed east of B-12 to verify conditions and assumptions used in preparation of this report. The majority of this investigation could be performed using CPT methods. Data obtained from these investigations would augment the boring, sampling and laboratory testing already performed. If subsurface conditions other than those described herein are encountered during construction or if additional design or layout changes are initiated, IGES must be informed so that our recommendations can be reviewed and revised as changes or conditions may require.

The following sub-sections present our recommendations for general site grading, design of foundations, slabs-on-grade, lateral earth pressures, and soil corrosion.

6.2 EARTHWORK

Prior to the placement of foundations, general site grading is recommended to provide proper support for foundations, exterior concrete flatwork, and concrete slabs-on-grade. Site grading is also recommended to provide proper drainage and moisture control on the subject property and to aid in preventing differential settlement of foundations as a result of variations in subgrade moisture conditions.

6.2.1 General Site Preparation and Grading

Below proposed structures, fills, and man-made improvements, all vegetation, topsoil, debris, and undocumented fill should be removed. Mass fill, pre-load, or surcharge may place excessive stress on any existing utilities due to the projected settlement. Any existing utilities or structures installed prior to the placement of mass fill should be re-routed or protected in-place.

6.2.2 Excavations

Based on conceptual construction plans we understand that most of the proposed structures are likely to be constructed on a thin layer of engineered fill in order to make a stable surface for construction purposes. All of the structures will also be at least partially buried within mass fill placed after their construction. The majority of the required excavations will be within the top five feet of current grade. Deeper excavations for the headworks and influent pump station buildings will be required for construction. These excavations will extend as much as 21 feet below the current ground surface. Until fill sources are identified their exact engineering properties cannot be known, assumed properties have been utilized in our assessment.

In the vicinity of the proposed operations and tertiary treatment/UV buildings, natural grade is at an approximate elevation of 4432 feet with berms from the existing shooting range located within a portion of the proposed building foot print. As shown on Plates A-2 and A-3 (explorations B-01 and B-02). The near-surface fill appears to be comprised of imported fill and may have been placed, but not well compacted, as part of previous site grading activities. These undocumented soils will be removed in order to reach the foundation elevation for the proposed construction. Removal of these soils can be accomplished with conventional excavation equipment, blasting of rock will not be required.

At present the bottom elevation of the headworks and influent pump station buildings are planned to be approximately 18 feet below existing site grade. Depending on the exact location of the structure and timing of construction in relation to other proposed facilities, it is possible that excavation may be accomplished without shoring of the sidewalls. However, we anticipate that even if space is not limited that excavations will not be sloped back and that shoring and dewatering (designed by the contractor) will be utilized to support the excavation.

Deeper excavation is likely to be required for the construction of connecting pipe network. In the extents of the project site our explorations encountered loose to medium dense fill and loose/soft native soils to approximately 30 feet below site grade (see Plate A-2 through A-10). Based on our experience during this investigation we anticipate that excavation in this area can be completed using conventional equipment (i.e. trackhoe). However, due to the presence of the shallow groundwater, excavations extending deeper than 5 feet may require cutoff shoring and/or a dewatering program.

6.2.3 Excavation Stability

Ultimately, the contractor is responsible for site safety, including all temporary trenches excavated at the site and design of any required temporary shoring. The contractor is responsible for providing the "competent person" required by Occupational Safety and Health Administration (OSHA) standards to evaluate soil conditions. Based on our investigations soils within the upper 12 feet should be treated as OSHA Type B soils. For excavations deeper than 12 feet the excavations should be governed by Type C soil recommendations. Close coordination between the competent person and IGES should be maintained to facilitate construction while providing safe excavations.

Based on OSHA guidelines for excavation safety, trenches with vertical walls up to 5 feet in depth may be occupied without additional shoring, unless the competent person sees signs of a potential cave-in. Where very moist soil conditions or groundwater is encountered, or when the trench is deeper than 5 feet, we recommend a trench-shield or shoring be used as a protective system to workers in the trench. Groundwater is present near the surface throughout the site. We anticipate that most excavations on-site will be shored and that shoring design will be provided by the contractor. Please contact IGES for additional slope stability analysis or shoring design if needed.

6.2.4 Excavation Dewatering

Groundwater was encountered at approximately 13 feet below grade in the vicinity of the tertiary treatment building. In addition, multiple pore pressure dissipation tests were performed in CPT-1 and CPT-2 and a piezometer installed in B-12. The pore pressure tests indicate that artesian pressures would be expected at depths greater than 65 feet below the current ground surface. For excavations of 30 feet or less, ground water should be expected to be approximately 4 to 6 feet below the current ground surface. If excavations are planned to extend below 4 feet, cutoff shoring or dewatering should be considered.

The contractor should plan means and methods to prevent surface flows from entering open excavations. Surface ditches, diversion berms, grading or a combination of those options should be implemented to preserve working conditions within the shallow excavation. If needed small submersible pumps should be sufficient to remove any moisture that falls within the excavation.

Where shoring is utilized for support of deep cuts additional dewatering may also be accomplished from within the excavation footprint. Hydrostatic forces should be considered in design of shoring, particularly in the event that the dewatering system needs to be turned off or fails. It should be anticipated that the base of the excavation will be at least partially saturated, soft, and that water may flow upward into the supported excavation. Pumps in the base of the excavation may be needed to control the inflow of groundwater. Construction of a permanent underdrain for any of the proposed structures may be incorporated into the system for dewatering.

The actual design of a dewatering system is beyond the scope of this report. The concepts discussed in this section should not be interpreted as a design for dewatering. Rather, they are key components that should be addressed in future design of a dewatering system.

6.2.5 Groundwater Management

If desired, an underdrain system may be constructed to prevent infiltration of groundwater into imported fill. If a free draining granular drain is installed we recommend that this drain layer be at least 12-inches thick, consist of clean (<5% passing #200 Sieve) free-draining rock. To protect against migration of fines into imported gravel, we recommend installation of a separation geofabric at the gravel-soil interface.

The Owner/Engineer may also consider the use of a geocomposite (drain-net) in place of a gravel drain. In addition to minimizing the potential for upward flow of groundwater a geocompsite consisting of a drainage "core" and non-woven geotextile will also provide separation and stability for compaction of the lower lifts of structural fill.

The contractor should be aware of the potential for groundwater drawdown to impact existing berms (sewage lagoons) to the north of the proposed construction. Excavation shoring and dewatering systems used during construction should be designed so as to minimize drawdown of groundwater beneath existing structures and embankments. Provisions should be made by the contractor to monitor existing berms during dewatering activities. The contractor could also utilize shoring that is designed to withstand hydrostatic forces from outside the excavation while managing groundwater on the inside of the excavations as necessary.

6.2.6 Structural Fill and Compaction

Where utilized, all fill placed for the support of structures, flatwork or pavements, should consist of structural fill. Structural fill should be comprised of pit run non-expansive granular fill. In all cases, structural fill should be relatively free of vegetation and debris, and contain no rocks larger than 4 inches in nominal size (6 inches in greatest dimension). If conventional footings are used and foundation excavation/over-excavation extends into native fine-grained soils we recommend the use of nonwoven geotextile fabric for stabilization and separation before placement of granular structural fill; a separation fabric is not required for structures supported on deep foundations.

All structural fill should be placed in maximum 6-inch loose lifts if compacted by small hand-operated compaction equipment, maximum 8-inch loose lifts if compacted by light-duty rollers, and maximum 12-inch loose lifts if compacted by heavy duty compaction equipment that is capable of efficiently compacting the entire thickness of the lift. Additional lift thickness may be permitted by IGES provided the contractor can demonstrate sufficient compaction can be achieved with the methods used. We recommend that all structural fill be compacted on a horizontal plane, unless otherwise approved by IGES. Structural fill placed beneath footings and pavements should be compacted to at least 95 percent of the MDD as determined by ASTM D-1557. The moisture content should be within 2% of the Optimum Moisture Content (OMC) for all structural fill. Prior to placing any fill, the excavations should be observed by IGES to confirm that unsuitable materials have been removed. In addition, proper grading should precede placement of fill, as described in the General Site Preparation and Grading subsection of this report.

All utility trenches backfilled below pavement sections, curb and gutter and concrete flatwork, should be backfilled with structural fill compacted to at least 95 percent of the MDD as determined by ASTM D-1557. All other trenches, including landscape areas, should be backfilled and compacted to approximately 90 percent of the MDD (ASTM D-1557).

Specifications from governing authorities having their own precedence for backfill and compaction should be followed where more stringent.

6.3 FOUNDATIONS

6.3.1 Clarifier and Bioreactor Complex

As mentioned in the General Conclusions, it is our recommendation the proposed clarifiers, bioreactors and the RAS/WAS buildings be designed using deep foundation system. Though several deep foundation alternatives may be acceptable, it is our opinion that driven piles will be the most efficient to install at this site. The exact elevation of the foundations has not yet been determined, but we understand they will be within ten feet of the existing ground surface. Prior to installing piles we recommend that the site be grubbed and that a relatively thin section of structural fill be placed to create a stable working surface.

Soil placed below the foundations and slabs should consist of compacted structural fill. Structural fill placed beneath foundations should meet the requirements outlined previously in Section 6.2.6. Based on prior experience with similar facilities we anticipate that the base of these treatment structures will consist of a thick concrete slab which will be reinforced and function as a large mat supported by deep foundations.

6.3.2 Headworks\Influent Pump Station Buildings

We understand the base of proposed headworks and influent pump station buildings are to be located approximately 18 feet below the current site grade. Based on the proposed layout of the headworks building in conjunction with our field observations and laboratory data, the building would experience settlement greater than one inch if founded on conventional footings. We recommend that the buildings be supported with a deep foundation system to mitigate excessive settlement of the structures. While other deep foundation alternatives may also be feasible, we have performed a preliminary design with driven pipe pile foundations starting near the surface. Soft soils will be encountered at the base of the proposed headworks excavation and will need to be stabilized to allow for mobility of equipment and personnel. A clean, coarse, angular gravel or gravel/cobble mixture (2-6 in. diameter) should be worked into the subgrade for this purpose. We anticipate that 2-3-ft of stabilization gravel/cobbles will be needed to support equipment and personnel during pile installation. The top 12-inches of this zone should consist of clean (<5% passing the #200 sieve) gravel having a maximum particle size ≤ 1-1/2 inch. Dewatering measures could also be designed to assist in stabilization of the excavation during construction.

6.3.3 Deep Foundation Alternatives

There are several deep foundation alternatives that could also be acceptable for use in support of the proposed structures. Driven piles, helical piers, micropiles, cast-in-place piles or driven piles are examples of systems that may be successfully implemented. We understand that a site fill of up to 10 feet above the existing grade will be placed around the structures during/after construction. The load from fill placed around the structures will cause excessive settlement of the structures unless proper support is provided. In order to provide required support the deep foundation system will need to extend past the near surface soft clay layers into the deeper granular soils in order to develop sufficient tip resistance. In addition, the downdrag forces imposed by the settlement beneath fill placed after construction of facilities should be accounted for in the foundation design.

Based on the installation time, size, and assumed load requirements of the proposed structures, it is our opinion that driven piles are best alternative to support proposed construction. Conceptual design for driven piles has been developed and is included in Appendix D.

6.3.3.1 Driven Piles

Driven piles should consist of at least 50 ksi steel. The option selected for evaluation consisted of a 12.75” outer diameter pile with a wall thickness sufficient to withstand the installation stresses. To protect against uplift (buoyancy) forces and to provide additional lateral resistance concrete is often used to fill the piles. In addition, rebar may be placed within the concrete to create a positive connection to the foundation of the building for uplift resistance. Alternatively, the piles may be extended into the foundation elements or steel plates with studs may be welded to the top of the piles to provide the connection. A structural engineer should be consulted for the design of the connection in association with the floor slab of each structure.

We have assumed that all of the buildings will be uniformly supported due to the anticipated thickness and rigidity of their floor slabs. All of the buildings will be located within 5 feet of the current ground surface with the exception of the headworks building, secondary clarifiers, and influent pump station; the base elevation of these structures will be located approximately 10 to 18 feet below the current ground surface. After the buildings are constructed approximately 10 feet of fill will be placed around or on top the proposed structures. The placement of the fill adjacent to structures will result in consolidation of the underlying soils. The consolidation may cause additional loads on the piles (as a downdrag force) and can impose undesired stresses on structures or pipe runs if they are not supported by a deep foundation system.

Based on the conceptual construction and grading information provided along with our assumptions regarding building loads, piles should be installed in a grid pattern with maximum center-to-center spacing of 8-ft in both directions. If equipment or operational/dynamic loads are expected at discrete locations within the footprint of proposed structures, additional deep foundation elements may be required in those locations. In our analysis we assumed a relatively thick foundation, and assumed that these foundations are rigid enough to support the load under the given spacing.

Given the relatively consistent soil stratigraphy observed in our investigations, we anticipate the majority of the piles will be driven to relatively uniform tip elevations. Figure D-1 located in Appendix D shows the allowable capacity vs. depth graphs and charts if the piles were installed to an approximate toe elevation of 4387 ft. Care should be exercised in using the capacities directly from the graph due to possible differences in the bearing layer at the tip of the pile. Due to the size of the Bioreactors, the soil below the central portions of structures will not be influenced by the settlement below fill placed around the building exterior, therefore the central piles will need to be installed only to an approximate tip elevation of 4397 ft, where an upper layer of granular soils exists. Figure D-2 located in Appendix D shows the allowable capacity vs. depth graph and charts if the piles were installed to that tip elevation. If a lateral load is anticipated, a structural engineer should be consulted to assess the structural component of the pile sufficient to resist the anticipated loads. Additional details of pile design, including lateral and uplift capacity are included in Appendix D.

The values listed in Appendix D only reflect the anticipated loads at the time of this report. If different capacities are required, IGES should be consulted for evaluation of the allowable pile resistances for the differing scenarios. It should be noted that our investigations were performed only within the original planned area for the treatment facility. The subsurface soils in the areas located to the east of the initial plant area were not investigated as part of this study, therefore the tip elevations listed above may vary in these areas. We recommend that additional explorations are performed to verify the existence of and depth to the granular soils in other areas of planned construction.

Construction of driven plies should also be accompanied by an appropriate testing program. Two percent of the piles or a minimum of two piles per structure should be tested using either static or dynamic testing.

6.4 SETTLEMENT

6.4.1 Consolidation Settlement

Settlement of structures that are founded on driven piles is anticipated to be less than 1 inch, with differential settlement less that ½ the total settlement. However, due to the placement of the fill around the new structures associated with the treatment facility, excessive settlement is likely in any of the unsupported areas between structures. This settlement could affect the regular operations if pipe runs are not also supported. Excessive movement of fill would likely induce significant stresses on pipe and pipe connections to structures that are supported by deep foundations. The anticipated settlement of the structures supported on driven piles is illustrated graphically on Figure D-5.

Support of structures and pipe runs by using deep foundations is the recommended method of settlement mitigation. As an alternative, preloading of the site using a 10-foot thick zone of imported fill was analyzed to estimate the expected settlement and time required to achieve 95% consolidation settlement. Using the Settle 3D v. 2.016 Software by Rocscience a settlement model was developed to estimate the magnitude of settlement and expected time required to complete settlement. Based on our model of the original plant layout and the assumed load, the site is projected to settle approximately 34 inches under a 10 ft soil preload. Approximately 520 days would be required in order to reach 95% consolidation settlement. Our model also predicted up to 8 inches of post-construction settlement depending on the loading and foundation elevation of proposed structures.

As another alternative we assessed the construction to include dewatering and sequenced overexcavation and placement of 15 feet of imported fill soils below existing site grade. Preloading of the site was then accomplished using native soils placed on top of imported fill. This alternative was considered in order that the majority of consolidation settlement would be complete in the time frame required for construction and reduce post-construction settlement to acceptable levels. In this scenario approximately 30 inches of pre-construction settlement is expected with up to 4 inches of site soil rebound when construction dewatering measures are terminated. Additional settlement and rebound would be expected if dewatering is utilized during operations, maintenance or to facilitate future construction and expansion of the plant. The conceptual construction stages and assumed schedule utilized in this sequenced overexcavation and preloading scenario are shown in Appendix D.

We anticipate that settlement tolerances for proposed facilities and piping will require selection and design of deep foundation alternatives. Structures supported by properly designed and constructed deep foundation systems experience less settlement when compared with conventional foundations in similar site conditions. If the preloading option is still desired, IGES will need to work with the contractor to assess the final construction schedule and determine if it should be modified to minimize the potential impacts of settlement. Additional monitoring, as outlined in the following section, would also need to be incorporated into construction plans and schedules.

6.4.1.1 Settlement Monitoring

If a significant amount of fill is placed to bring the current site elevations to final grade or preload is used to mitigate settlement, we recommend that a settlement monitoring system be implemented both during the preload and construction phases of the project. The monitoring will likely consist of a combination of top level survey, monometers, vibrating wire piezometers, and magnetic extensometers. If surcharge is used in conjunction with a shallow foundation system, the fill should be placed and monitored until data shows that primary consolidation is complete.

During the preload phase of fill placement, measurements should be reported for settlement both at the top of the fill and near the depth of the proposed foundations. The measurement should be recorded by, or supplied to, IGES Inc. to determine the degree of settlement at the time of the readings and to predict completion of the settlement. The time required and magnitude of total settlement could vary and if the unit weights and thickness of the fill vary from our stated assumptions.

If a preloading alternative for settlement mitigation is selected, monitoring should be conducted during the construction phase of the project to confirm the design assumptions.

6.5 EARTH PRESSURES AND LATERAL RESISTANCE

Lateral forces imposed upon conventional foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footing and the supporting soil. In determining the frictional resistance against concrete, a coefficient of friction of 0.30 for native clayey soils or 0.55 for imported granular fill may be used.

Ultimate lateral earth pressures from native soils and *granular* backfill acting against retaining walls and buried structures may be computed from the lateral pressure coefficients or equivalent fluid densities presented in Table 2.

Table 2 – Lateral Forces for Native and Imported Materials

	Native Clay Soil		**Imported Granular Fill**	
Condition	**Lateral Pressure Coefficient**	**Equivalent Fluid Density (pcf)**	**Lateral Pressure Coefficient**	**Equivalent Fluid Density (pcf)**
		Static		
Active (K_a)	0.33	38	0.26	34
At-rest (K_0)	0.50	58	0.41	53
Passive (K_p)	3.00	345	3.85	500
		Seismic		
Pseudo-static (K_{AE} - seismic)	0.44	51	0.35	46

These coefficients and densities assume no buildup of hydrostatic pressures. The force of the water should be added to the presented values if hydrostatic pressures are anticipated. Clayey soils drain poorly and may swell upon wetting, thereby greatly increasing lateral pressures acting on earth retaining structures; therefore, clayey soils should not be used as retaining wall backfill. Backfill should consist of either previously imported sandy soil or imported material with an Expansion Index (EI) less than 20.

For seismic analyses, the *active* earth pressure coefficient provided in the table is based on the Mononobe-Okabe pseudo-static approach and only accounts for the dynamic horizontal thrust produced by ground motion. Hence, the resulting dynamic thrust pressure *should be added* to the static pressure to determine the total pressure on the wall. The pressure distribution of the dynamic horizontal thrust may be closely approximated as an inverted triangle with stress decreasing with depth and the resultant acting at a distance approximately 0.6 times the loaded height of the structure, measured upward from the bottom of the structure.

The seismic *at-rest* earth pressure coefficient provided in the table is based on studies conducted by Wood (1973). This coefficient only accounts for the dynamic horizontal thrust produced by ground motion, and the magnitude of the resulting parabolic-type loading may be roughly approximated by assuming a uniform pressure distribution. This results in a dynamic thrust equal to the product of the coefficient, the soil unit weight, and the square of the loaded height of the structure. This load can be assumed to act at a distance of approximately 0.6 times the loaded height of the structure, measured upward from the bottom of the structure. The dynamic thrust *should be added* to the static (i.e., gravity) force to determine the total load on the wall.

Structural design which incorporates these values should use an appropriate factor of safety against overturning and sliding; a value of 1.5 is typical. Additionally, if passive resistance is calculated in conjunction with frictional resistance, the passive resistance should be reduced by one half.

Overcompaction adjacent to walls should be avoided. Resisting passive earth pressure from soils subject to frost or heave, or otherwise above prescribed minimum depths of embedment, should usually be neglected in design.

6.6 CONCRETE SLAB-ON-GRADE CONSTRUCTION

To minimize settlement and cracking of slabs, and to aid in drainage beneath the concrete floor slabs, all concrete slabs should be founded on a minimum 4-inch layer of compacted gravel overlying structural fill. The gravel should consist of free draining gravel or road base with a 3/4-inch maximum particle size and no more than 5 percent passing the No. 200 mesh sieve. The layer should be compacted to at least 95 percent of the MDD as determined by ASTM D-1557. Other earth materials not meeting the criteria above may be suitable for construction; alternate materials should be evaluated on a case-by-case basis and should be approved by IGES.

All concrete slabs should be designed to minimize cracking as a result of shrinkage. Consideration should be given to reinforcing the slab with a welded wire fabric, re-bar, or fibermesh. Slab reinforcement should be designed by the structural engineer.

6.7 MOISTURE PROTECTION AND SURFACE DRAINAGE

It is our understanding that the proposed depth of the foundations of most structures are proposed to be located above the current site grade. In order to limit water infiltration into the foundation soils, we recommend that free draining granular fill be placed above the native clays that should extend to the footing level. If the site is to be preloaded, the granular fill should extend a minimum of 40 inches above the proposed elevation of the footings to allow the footings to bear on the granular fill after the consolidation of the soils has occurred . A filter fabric should be used as a separation layer between the granular fill and the native clayey soils.

6.8 PRELIMINARY SOIL CORROSION POTENTIAL

As mentioned previously current construction plans call for a significant amount of fill to be placed at the site. Most elements of proposed construction will be founded in this fill and not come in contact with native soils that exist at greater depth. The source of the imported was not known at the time of this report, therefore no preliminary corrosion evaluation could be provided on the fill materials.

Native soils were tested for preliminary soil corrosion potential. Initial testing of soluble sulfate content was performed and indicated that the native soils have a low potential for sulfate attack of concrete. Based on these results we recommend that all concrete contain Type I or Type II cement.

Metal corrosivity of the native soils was also evaluated based on the resistivity and pH tests. These results indicate that the native soils are severely corrosive to metal. Based on these results, we recommend a corrosion engineer be consulted as necessary for any piping or steel reinforcement that will be placed in direct contact with native soils below the existing site grade. Further, any imported fill should be evaluated prior to placement.

7.0 CLOSURE

7.1 LIMITATIONS

The recommendations contained in this report are based on our review of previously performed studies, limited field exploration, laboratory testing, and understanding of the proposed construction. The subsurface data used in the preparation of this report were obtained from the explorations made for this investigation. It is possible that variations in the soil and groundwater conditions could exist between the points explored. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site that are different from those described in this report, we should be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope or location of the proposed construction changes from that described in this report, IGES should be notified.

This report was prepared in accordance with the generally accepted standard of practice at the time the report was written. No warranty, expressed or implied, is made.

It is the Client's responsibility to see that all parties to the project including the Designer, Contractor, Subcontractors, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

7.2 ADDITIONAL SERVICES

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during construction. IGES staff should be on site to verify compliance with these recommendations. These tests and observations should include, but not necessarily be limited to, the following:

- Observations and testing during site preparation, earthwork and structural fill placement.
- Observation of foundation soils to assess their suitability for footing placement.
- Observation of soft/loose soils over-excavation.
- Observation of temporary excavations and shoring.
- Consultation as may be required during construction.

- Quality control and observation of concrete placement.

We also recommend that project plans and specifications be reviewed by us to verify compatibility with our conclusions and recommendations. Additional information concerning the scope and cost of these services can be obtained from our office.

We appreciate the opportunity to be of service on this project. Should you have any questions regarding the report or wish to discuss additional services, please do not hesitate to contact us at your convenience at (801) 270-9400.

8.0 REFERENCES CITED

Barker, K.S. and Barker S.W., 1993, Interim Geologic Map of the Wellsville Quadrangle, Cache County, Utah, Utah Geological Survey Contract Report 93-2, scale 1:24,000

Black, B.D., Hylland, M.D., Haller, K.M., and Hecker, S., compilers, 1999, Fault number 2352b, East Cache fault zone, central section, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 04/30/2013 10:27 AM.

Black, B.D., DuRoss, C.B., Hylland, M.D., and Hecker, S., compilers, 2004, Fault number 2521b, West Cache fault zone, Junction Hills fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 04/30/2013 10:32 AM.

ConeTec, Inc. (ConeTec), 2013, Cone Penetration Test Data, Proposed Logan Water Treatment Plant, Prepared for IGES, Inc., Unpublished Consultants Report, 21 pp (including appendices)

Federal Emergency Management Agency [FEMA], 1997, *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures*, FEMA 302, Washington, D.C.

Frankel, A., Mueller, C., Barnard, T., Perkins, D., Leyendecker, E.V., Dickman, N., Hanson, S., and Hopper, M., 1996, *National Seismic-hazard Maps: Documentation*, U.S. Geological Survey Open-File Report 96-532, June.

Hintze, L.F., 1980, Geologic Map of Utah: Utah Geological and Mineral Survey Map-A-1, scale 1:500,000.

Hintze, L.F., 1993, "Geologic History of Utah" Brigham Young University Studies, Special Publication 7, 202p

International Building Code [IBC], 2012, International Code Council, Inc.

Personius, S.F., and Scott, W.E., 1992, Surficial geologic map of the Salt Lake City segment and parts of adjacent segments of the Wasatch fault zone, Davis, Salt Lake, and Utah Counties, Utah: U.S. Geological Survey Miscellaneous Investigations Series Map I-2106, scale 1:50,000.

Sack, D. M., 2005, Geologic Map of the Clearfield 7.5' Quadrangle, Davis County, Utah, Utah Geological Survey Miscellaneous Publication (MP-05-04), 14 p., 2 pl, ISBN 1-55791-724-8.

Solomon, B.J., McCalpin, J.P., and McBride, J.A., 2001, Liquefaction Hazards for the Wellsville Quadrangle, Central Cache Valley, Utah, map scale 1:24,000.

Utah Geological Survey (UGS), 2003, Liquefaction Potential in Cache Valley, Cache County, Utah, Public Information Series 79, 2 p., 1 figure, approximate scale 1:166,700.

Scott, W.E., McCoy, W.D., Shorba, R.R., and Meyer, R., 1983, Reinterpretation of the exposed record of the last two cycles of Lake Bonneville, western United States: Quaternary Research, v.20, p. 261-285.

USGS (2013) U. S Seismic Design Maps Ground Motion Parameter Calculator – Version 3.0.1 (http://geohazards.usgs.gov/designmaps/us/application.php), last updated 12 July 2012, uses the International Building Code (2008 IBC) seismic hazard maps

USGS, 2012, Quaternary Fault and Fold Database of the United States, (http://earthquakes.usgs.gov/regional/qfaults), accessed March 2012

Utah Geological Survey – Selected Critical Facilities and Geologic Hazards, Davis County, Utah

Wood, J.H., 1973, "Earthquake-induced soil pressures on structures." California Institute of Technology, EERL 73-05

TABLE OF CONTENTS

APPENDICES

1.0 EXECUTIVE SUMMARY

This report presents the results of a geotechnical investigation conducted for the proposed improvements to the Logan Water Treatment Plant west of Logan, Utah. The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the site and to provide general recommendations for site grading, excavation support and the design and construction of foundations for new buildings, tanks (digesters) utility lines connecting the improvements.

The subsurface soil conditions were explored at the west portion of the subject property by advancing eight borings across the proposed construction areas; two CPT soundings were also completed. The location of the borings and CPT soundings are shown on Plate A-1 in Appendix A. Subsurface soil conditions were logged during our field investigation and are presented on the boring logs and CPT logs presented on (Plates A-2 through A-9 and A-11 through A-12) of Appendix A. The subsurface conditions encountered during our investigation are discussed below. After completion of our initial investigation it was determined that the initial construction footprint will extend farther east than originally anticipated. While we did not encounter dramatically different conditions in our explorations, it is our recommendation that prior to construction additional exploration and testing be performed in the expanded construction area to confirm subsurface conditions and determine if modifications to our recommendations are necessary.

Based on our observations and geologic literature review, the site is underlain by Late Quarternary-aged lacustrine silt and clay deposited by Lake Bonneville (Barker & Barker, 1993). It is estimated that the upper 30 feet of the soil in the explorations consists of fine-grained silts and clays. Low blow counts, high measured moisture contents and dry densities within this soil also indicate that soft CLAY is highly compressible. Below 30 feet the soil profile begins to include some sandy layers from 1 to 11 ft thick

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for the proposed development provided that the recommendations contained in this report are incorporated into the design and construction of the project. In recent discussions Carollo has expressed their plan to add several feet of fill to the site in order to avoid shallow groundwater during initial construction, long term operation as well as future plant expansions. In order to allow the plant to operate without excessive pumping it is our understanding that the proposed structures will be at least partially if not fully buried within imported fill that is placed above the existing grade. This fill may be as large as 10 ft above existing grade and will be placed and compacted around the structures to allow for site access. To allow for gravity flow to the facility, the Headworks building will be constructed below the existing grade then evacuated by pumping up into the other treatment works.

New construction and fill placed above the current site grade would induce new loads and result in consolidation settlement of native soils. Settlement could be mitigated through preloading of the site as well as careful coordination of earthwork and other construction activities; however, in consideration of the time required and potential for interruption of the required construction schedule it is our recommendation that a deep foundation system be utilized for support of all structures and pipe runs. The planned placement of fill surrounding and between structures after construction would also induce settlement that may be difficult to account for in setting pipe elevations for future connection. Design loads for proposed facilities were not prepared at the time of this report. Based on our understanding of proposed construction a conceptual design for driven piles to support structures is presented later in this report.

If the structures are founded on shallow foundations above grade, loading will be new to the soft and compressible native soils. In this report IGES has also evaluated settlement associated with this increased surface load and structures supported by conventional, shallow foundations. Based on the measured consolidation properties of soil at the site and the quantity of fill anticipated we have calculated anticipated settlement under pre construction fill (12 feet high) will reach approximately 34 inches. If the site is preloaded, settlement should be substantially complete in approximately 520 days. Depending on the elevation of conventional foundations and the actual structural loads, post-construction settlement up to 8 inches is possible.

We recommend that IGES inspect the bottom of the foundation excavation prior to the placement of structural fill, reinforcing steel or concrete in order to identify any unsuitable soils and to observe/document the quality of fill placement. All fill beneath the foundations should be placed and compacted in accordance with our recommendations contained in Section 6.2.6 of this report

NOTE: The scope of services provided within this report are limited to the assessment of the subsurface conditions at the subject site. The executive summary is provided solely for purposes of overview and is not intended to replace the report of which it is part and should not be used separately from the report.

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a geotechnical investigation conducted for the proposed improvements to the Logan Water Treatment Plant west of Logan, Utah. The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the site and to provide general recommendations for site grading, excavation support and the design and construction of foundations for new buildings, tanks (digesters), and utility lines connecting the improvements.

The scope of work completed for this study included a site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analyses, and preparation of this report. Our services were performed in accordance with our proposal and signed authorization to proceed, dated January 23, 2013.

The recommendations contained in this report are subject to the limitations presented in the "Limitations" section of this report (Section 7.1).

2.2 PROJECT UNDERSTANDING AND DESCRIPTION

The subject property is located at 4252 West 2200 South, west of Logan, Utah. The property is bounded on the south by 600 North, on the north by the existing sewer lagoons, on the east by undeveloped land and to the west by the police shooting range and buildings associated with the lagoon operations.

We understand that preliminary plans for the Logan Wastewater Treatment Plant consisted of multiple phases of construction. The initial phase is to include at least six clarifiers, a tertiary treatment building, headworks building, and three bioreactors. Utilities will also be installed to each of the new structures. Future planned phases include additional bioreactors, clarifiers and other tanks and structures that will be located to the east of the earlier phase. Depending on costs, some of these additional treatment features may be included in the initial construction.

The clarifiers will be approximately 75 foot diameter tanks that were assumed to be approximately 18 feet tall. It was assumed that the tanks would be constructed out of concrete. They will be used to store and process waste water with an approximate unit weight of water (62.4 pcf). The Bioreactors will be approximately 300 feet long, 75 feet wide, and were assumed to be approximately 18 feet tall. The Bioreactor will be constructed using concrete and will be used to store and treat solid waste in solution near to the approximate unit weight of water.

After completion of our field work and subsequent discussions with Carollo it has been determined that most of the proposed structures will be constructed within five feet of the existing grade, and will be placed on a relatively thin layer of compacted fill. Additional fill up to 10 ft in height will be placed around the structures once construction is completed. The one exception will be the headworks building, which must be located below grade to allow for gravity flow of waste water entering the facility. Any structures or fill placed above existing grade will apply "new" loads to the soft and compressible native soils. In this report IGES will evaluate settlement associated with the anticipated increase to surface loads as well as options for supporting the structures on a deep foundation system or pre-loading the site to meet different construction schedules.

The clarifiers and bioreactors will typically have about 15 ft of liquid in them and will be full the majority of the time. We anticipate they will be emptied occasionally for regular cleaning/maintenance. Rebounding of soils associated with the periodic unloading of the structures will also be evaluated in this report.

3.0 METHODS OF STUDY

3.1 FIELD INVESTIGATION

As a part of this investigation, near surface soil conditions were explored by drilling eight boreholes and performing two Cone Penetration Test (CPT) soundings throughout the proposed 1st phase of the improvements. A member of our technical staff visually logged the soil in the borings at the time of excavation in general accordance with the Unified Soil Classification System (USCS). The boring depths varied from approximately 50.5 feet to 71.5 feet below the existing site grade. CPT Soundings in CPT-01 and CPT-02 extended to 100 and 50 feet below site grade, respectively. The approximate locations of each exploration are shown on Plate A-1 *Site Map.* The boring logs are included at the end of this report (Plates A-2 thru A-9). A *Key to Soil Symbols and Terminology* is provided on Plate A-10. Continuous CPT logs are presented on Plates A-11 and A-12 and a discussion of the site conditions encountered in these explorations is provided in Section 4.0 of this report.

The borings were advanced with a CME 85 track mounted drill rig. Representative soil samples were collected and visually classified by a member of our technical staff. Disturbed soil samples were collected using a Standard Penetration Test (SPT) split spoon sampler and placed into bags. Relatively undisturbed samples were obtained using the Dames and Moore "U" sampler and Shelby tubes. The samples were carefully packaged and transported to our laboratory for appropriate testing.

3.2 LABORATORY INVESTIGATION

Geotechnical laboratory tests were conducted on selected relatively undisturbed and bulk soil samples obtained during our field investigation. The laboratory testing program was designed to evaluate the engineering characteristics of onsite earth materials. Laboratory tests conducted during this investigation included:

- In situ moisture content and dry density
- Atterberg Limits
- Grain Size Distribution (Sieve)
- Consolidation (One-Dimensional, Time Rate and Constant Rate of Strain)
- Strength testing (Direct Shear, Triaxial-Unconsolidated Undrained)

Results of the in situ dry density, moisture content, and Atterberg limits tests are shown on the boring logs Appendix A (Plates A-2 through A-9). The results of remaining laboratory tests are presented on the Summary of Laboratory Test Results Table and test result plates presented in Appendix B

3.3 ENGINEERING ANALYSIS

Engineering analyses were performed using data obtained from field investigations and the laboratory testing. Appropriate factors of safety have been applied to the analyses performed, consistent with industry standards and the accepted standard of care.

4.0 GENERALIZED SITE CONDITIONS

4.1 SURFACE CONDITIONS

At the time of our field investigation, the majority of the proposed locations for the improvements of the Logan Water Treatment Plant were in undeveloped areas. An existing police shooting range was located on the west side of the proposed construction. The property contained one structure associated to the shooting range. Also, some embankments were located within the shooting range boundaries. Overall the site sloped slightly to the west.

4.2 SUBSURFACE CONDITIONS

The subsurface soil conditions were explored at the subject property by advancing eight borings across the proposed construction area, two CPT soundings were also completed. Subsurface soil conditions were logged during our field investigation and are included in the boring logs and CPT logs are in Appendix A at the end of this report (Plates A-2 through A-9 and A-11 through A-12). The conditions encountered during our investigation are discussed below.

4.2.1 Earth Materials

The existing police shooting range which is located on the west side of the project site was explored by advancing borings B-01 and B-02. This area contained approximately 4 feet of imported fill directly underlain by a medium stiff Fat CLAY to approximately 9 feet below grade at the time of our investigation. Below the Fat CLAY a medium stiff Lean CLAY extends to approximately 19 feet. A soft Fat CLAY layer is located below the Lean CLAY and extends to approximately 39 feet. Below the soft Fat CLAY layer a variation of Lean CLAY and SAND extends to the bottom of the explorations. Preliminary plant design included placement of the headworks and tertiary treatment buildings on the western portions of the shooting range area. These plans have since been modified, and those buildings will be located further to the east.

The remaining borings were located in a field located on the east side of the shooting range. In this area a thin layer of topsoil was observed to be approximately 6 to 24 inches thick. Generally underlying the topsoil, a layer of stiff Lean to Fat CLAY extending to approximately 19 feet below the ground surface was observed. Below the stiff CLAY a soft layer of CLAY was observed from approximately 19 feet to 29 feet. Below the soft CLAY a stiff layer of CLAY was observed to extend to approximately 34 feet below site grade where SILT and SAND were observed to the end of the explorations.

Based on the results of our investigations the silt and sand layer appears to be in place at a relatively consistent elevation below grade across the site.

The stratification lines shown on the enclosed boring logs represent the approximate boundary between soil types (Plates A-2 through A-9). The actual in-situ transition may be gradual and vary laterally based on depositional environment and, in some cases, seismic activity. Due to the nature and depositional characteristics of the native soil, care should be taken in interpolating subsurface conditions between or extrapolating conditions beyond the exploration locations.

4.2.2 Groundwater/Moisture Conditions

Groundwater was observed in most of the subsurface investigations. However, due to the drilling methods used (rotary wash) to advance the borings most measurements of the groundwater could not be accurately taken at the time of our investigation. To better determine the depth to groundwater multiple pore pressure dissipation tests were performed in the two CPT explorations. Based on the measurement taken in B-1, the groundwater table was measured/estimated to be approximately 13 feet below the existing ground surface at that location. The CPT pore pressure dissipation tests indicate that artisan water pressure would be expected at depths greater than 65 feet below the ground surface. However, at depths of approximately 30 feet below the ground surface, the groundwater level would be approximately 5 feet.

A single piezometer was installed in Boring B-12, near the center of proposed construction. Subsequent measurements taken by Logan City personnel have indicated that groundwater is approximately 4.5 to 5 feet below grade.

It is our experience that during snowmelt, runoff, irrigation on surrounding properties, high precipitation events, and other activities, the groundwater level can fluctuate several feet. It is our understanding that the groundwater elevation may rise to very near the existing grade and may be influenced somewhat by existing Logan Sewer Treatment Ponds;

therefore the area and may experience minimal fluctuation from the natural climactic variables mentioned above.

5.0 GEOLOGIC CONDITIONS

5.1 GEOLOGIC SETTING

5.1.1 Regional Geology

Cache Valley is in the northeast corner of the Basin and Range physiographic province Cache Valley is a graben bounded on the east and west by high angle normal faults. On the west side, the West Cache Fault is expressed at the foot of the Wellsville Mountains, and the East Cache Fault is located at the foot of the Bear River Range on the east. The West Cache Fault (commonly referred to as the Wellsville Fault: Williams, 1948, 1958, 1962; Beer, 1967; Bjorklund and McGreevy, 1971) runs roughly northwest-southeast, is located immediately east and at the foot of the Wellsville Mountains and is down-thrown to the east.

5.1.2 Local Geology

The area in and around the site is underlain by fine-grained, low-permeability lacustrine soil with generally high plasticity. Thicker sandy layers are present at depths below about 30 feet. There are no known faults, unstable slopes, or subsidence areas in the vicinity of the proposed water treatment plant.

Surface sediments at the site are mapped as Lacustrine Silt and Clay of the Lake Bonneville Alloformation (Qli). These silts and clays are the most extensive sediments of the Lake Bonneville Alloformation in the Cache Valley. They are mainly found in the valley at a lower elevation than the Lake Bonneville Alloformation gravel. They represent suspended sediments that settled from the lake water onto the lake bottom. Outcrops of these sediments are restricted mainly to the banks of the Little Bear River, Logan River and their tributaries. Along the eastern edge of the Lake Bonneville Alloformation gravel the clays onlap and interfinger with the Lake Bonneville sand and gravel. (Barker and Barker, 1993).

The site is located in the northern portion of the area mapped by Barker and Barker (1993); in this area the groundwater table is reported to be almost at the surface. Bjorklund and McGreevy (1971) mention that the high water level impedes the downward movement of water applied to the surface, thereby increasing the waterlogged condition. This effects the Qli sediments in the valley along the little bear River, the Logan River and their tributaries.

Based on site investigations, shallow soil in underlying the site consists of fine-grained clay with occasional fine sand layers. When these sandy layers contain groundwater, they are considered part of the shallow water-bearing zone, as discussed in the following section on hydrogeologic conditions. Geotechnical analyses indicate that the shallow clays are highly plastic and generally classify as CH, which is considered an inorganic clay of high plasticity (fat clay), according to the Unified Soil Classification System (USCS). Vertical permeabilities are low, ranging from $6x10^{-7}$ to $4x10^{-8}$ cm/sec. Based on the laboratory testing the natural moisture content of these soils ranges from 18 to 76 dry unit weights vary from 58 to 113 pcf. Geotechnical laboratory test data is included on the attached boring logs in Appendix A (A-2 through A-9) and in Appendix B.

5.2 SEISMICITY AND FAULTING

Review of available fault mapping indicates that there are no known active faults that pass under or immediately adjacent to the site. The site is located approximately 5.4 miles west of the central section of the East Cache fault zone and 4.2 miles east of the junction Hills fault of the West Cache fault zone (USGS, 2013). The East Cache fault zone has three sections which are differentiated based and fault zone complexity, tectonic geomorphology and expression of the surface fault scarps. The central section of the fault is the most active of the three in the latest quaternary, the northern and southern sections are less active and shown evidence of only middle to late Pleistocene activity (Black et al, 1999).

Seismic hazard maps depicting probabilistic ground motions and spectral response have been developed for the United States by the U. S. Geological Survey as part of NEHRP/NSHMP (Frankel et al., 1996). These maps have been incorporated into both *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* (FEMA, 1997) and the *International Building Code* (IBC) (International Code Council, 2012). Spectral responses for the Maximum Considered Earthquake (MCE) are shown in the table below. These values generally correspond to a two percent probability of exceedance in 50 years (2PE50) for a “firm rock” site. To account for site effects, site coefficients which vary with the magnitude of spectral acceleration are used. Based on boring explorations and measurements of shear wave velocities (ConeTec, 2013) it is our opinion that this location is best described as a Site Class E (soft soil profile). The spectral accelerations are shown in the table below. The spectral accelerations are calculated based on the site's approximate latitude and longitude of 41.738244˚N and -111.897002˚W, respectively. Based on IBC, the site coefficients are F_a=0.90 and F_v= 2.63. From this procedure the peak ground acceleration (PGA) is estimated to be 0.365 g. The MCE PGA and Design response spectrum are presented in Appendix C on Plate C-1.

MCE Seismic Response Spectrum Spectral Acceleration Values for IBC Site Class E [a]			
Site Location: Lat. 41.738244ºN Long. -111.897002ºW			
Spectral Period (sec)	**Mapped Spectral Acceleration Values (g) (Site Class B)**	**Site Coefficients: (Site Class E)**	**Mapped Response Spectral Acceleration (g)[a]**
0.2	S_S = 1.014	Fa = 0.90	S_{MS}=(S_S x Fa) = 0.913
1.0	S_1 = 0.318	Fv = 2.63	S_{M1}=(S_1 x Fv) = 0.868
[a] IBC 1615.1.3 recommends reducing the mapped values by 1/3 to obtain the design spectral response acceleration values.			

5.3 OTHER GEOLOGIC HAZARDS

Geologic hazards can be defined as naturally occurring geologic conditions or processes that could present a danger to human life and property. We assume that geologic hazards were considered during initial development of the existing sewage lagoons, and that the location of the proposed facility will not be altered to avoid additional hazards if present. Additional assessment of all potential gelogic hazards was not considered necessary for this report. However, in addition to seismicity the other identified geologic hazard considered for this site is liquefaction.

5.3.1 Liquefaction

Certain areas within the intermountain region possess a potential for liquefaction during seismic events. Liquefaction is a phenomenon whereby loose, saturated, granular soil deposits lose a significant portion of their shear strength due to excess pore water pressure buildup resulting from dynamic loading, such as that caused by an earthquake. Among other effects, liquefaction can result in densification of such deposits causing settlements of overlying layers after an earthquake as excess pore water pressures are dissipated. The primary factors affecting liquefaction potential of a soil deposit are: (1) level and duration of seismic ground motions; (2) soil type and consistency; and (3) depth to groundwater.

Referring to the “Liquifacation Potential Map for Cache Valley, Cache County, Utah” map published by the Utah Geological Survey (UGS, 2003), the site is located within an area designated as "low" for liquefaction potential. Other mapping of the area (Solomon et al, 2001) designates the site as having "moderate" liquefaction potential. Based on the field data collected for this site we would classify the site as having moderate potential for liquefaction. According to Solomon, liquefaction was not documented in "moderate" zones during the 1962 Cache Valley Earthquake even though ground water is shallow and loose granular deposits do exist at depths below 30-35 feet in these areas. The predominant sediments encountered consist of fine-grained, high plasticity soils which are not susceptible to liquefaction. With few exceptions, the relatively thin layers containing granular deposits typically contained a significant portion of fine-grained soils as well.

6.0 ENGINEERING CONCLUSIONS AND RECOMMENDATIONS

6.1 GENERAL CONCLUSIONS

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for the proposed development, provided that the recommendations contained in this report are incorporated into the design and construction of the project.

The majority of soils encountered at the site consist of highly compressible clays. Settlement of these soils is the main geotechnical concern associated with the proposed project. In order to minimize the impacts of groundwater during both construction and long term maintenance of the facility Carollo has informed us of their intent to build most new facilities above the current site grade on imported fill, additional fill height is also desired around planned structures for access. As mentioned previously it is also likely that the treatment plant will be expanded to meet the future needs of a growing population. Along with planning for hydraulic operations of the expanded plant, earthwork associated with initial construction must take into consideration the construction of future facilities.

New construction and fill placed above the current site would induce new loads and result in consolidation settlement of native soils. Settlement could be mitigated through preloading of the site as well as careful coordination of earthwork and other construction activities; however, in consideration of the time required and potential for interruption of the required construction schedule it is our recommendation that a deep foundation system be utilized for support of all structures and pipe runs. The planned placement of fill surrounding and between structures after construction would also induce settlement that may be difficult to account for in setting pipe elevations for future connection. Design loads for proposed facilities were not prepared at the time of this report. Based on our understanding of proposed construction a conceptual design for driven piles to support structures is presented later in this report.

It is possible that variations in soil stratigraphy exist between and beyond points explored. Based on recent discussions with Carollo, the site layout has been modified somewhat to extend the first phase of construction further east of the area initially explored. It is our recommendation that additional subsurface investigation be performed east of B-12 to verify conditions and assumptions used in preparation of this report. The majority of this investigation could be performed using CPT methods. Data obtained from these investigations would augment the boring, sampling and laboratory testing already performed. If subsurface conditions other than those described herein are encountered during construction or if additional design or layout changes are initiated, IGES must be informed so that our recommendations can be reviewed and revised as changes or conditions may require.

The following sub-sections present our recommendations for general site grading, design of foundations, slabs-on-grade, lateral earth pressures, and soil corrosion.

6.2 EARTHWORK

Prior to the placement of foundations, general site grading is recommended to provide proper support for foundations, exterior concrete flatwork, and concrete slabs-on-grade. Site grading is also recommended to provide proper drainage and moisture control on the subject property and to aid in preventing differential settlement of foundations as a result of variations in subgrade moisture conditions.

6.2.1 General Site Preparation and Grading

Below proposed structures, fills, and man-made improvements, all vegetation, topsoil, debris, and undocumented fill should be removed. Mass fill, pre-load, or surcharge may place excessive stress on any existing utilities due to the projected settlement. Any existing utilities or structures installed prior to the placement of mass fill should be re-routed or protected in-place.

6.2.2 Excavations

Based on conceptual construction plans we understand that most of the proposed structures are likely to be constructed on a thin layer of engineered fill in order to make a stable surface for construction purposes. All of the structures will also be at least partially buried within mass fill placed after their construction. The majority of the required excavations will be within the top five feet of current grade. Deeper excavations for the headworks and influent pump station buildings will be required for construction. These excavations will extend as much as 21 feet below the current ground surface. Until fill sources are identified their exact engineering properties cannot be known, assumed properties have been utilized in our assessment.

In the vicinity of the proposed operations and tertiary treatment/UV buildings, natural grade is at an approximate elevation of 4432 feet with berms from the existing shooting range located within a portion of the proposed building foot print. As shown on Plates A-2 and A-3 (explorations B-01 and B-02). The near-surface fill appears to be comprised of imported fill and may have been placed, but not well compacted, as part of previous site grading activities. These undocumented soils will be removed in order to reach the foundation elevation for the proposed construction. Removal of these soils can be accomplished with conventional excavation equipment, blasting of rock will not be required.

At present the bottom elevation of the headworks and influent pump station buildings are planned to be approximately 18 feet below existing site grade. Depending on the exact location of the structure and timing of construction in relation to other proposed facilities, it is possible that excavation may be accomplished without shoring of the sidewalls. However, we anticipate that even if space is not limited that excavations will not be sloped back and that shoring and dewatering (designed by the contractor) will be utilized to support the excavation.

Deeper excavation is likely to be required for the construction of connecting pipe network. In the extents of the project site our explorations encountered loose to medium dense fill and loose/soft native soils to approximately 30 feet below site grade (see Plate A-2 through A-10). Based on our experience during this investigation we anticipate that excavation in this area can be completed using conventional equipment (i.e. trackhoe). However, due to the presence of the shallow groundwater, excavations extending deeper than 5 feet may require cutoff shoring and/or a dewatering program.

6.2.3 Excavation Stability

Ultimately, the contractor is responsible for site safety, including all temporary trenches excavated at the site and design of any required temporary shoring. The contractor is responsible for providing the "competent person" required by Occupational Safety and Health Administration (OSHA) standards to evaluate soil conditions. Based on our investigations soils within the upper 12 feet should be treated as OSHA Type B soils. For excavations deeper than 12 feet the excavations should be governed by Type C soil recommendations. Close coordination between the competent person and IGES should be maintained to facilitate construction while providing safe excavations.

Based on OSHA guidelines for excavation safety, trenches with vertical walls up to 5 feet in depth may be occupied without additional shoring, unless the competent person sees signs of a potential cave-in. Where very moist soil conditions or groundwater is encountered, or when the trench is deeper than 5 feet, we recommend a trench-shield or shoring be used as a protective system to workers in the trench. Groundwater is present near the surface throughout the site. We anticipate that most excavations on-site will be shored and that shoring design will be provided by the contractor. Please contact IGES for additional slope stability analysis or shoring design if needed.

6.2.4 Excavation Dewatering

Groundwater was encountered at approximately 13 feet below grade in the vicinity of the tertiary treatment building. In addition, multiple pore pressure dissipation tests were performed in CPT-1 and CPT-2 and a piezometer installed in B-12. The pore pressure tests indicate that artesian pressures would be expected at depths greater than 65 feet below the current ground surface. For excavations of 30 feet or less, ground water should be expected to be approximately 4 to 6 feet below the current ground surface. If excavations are planned to extend below 4 feet, cutoff shoring or dewatering should be considered.

The contractor should plan means and methods to prevent surface flows from entering open excavations. Surface ditches, diversion berms, grading or a combination of those options should be implemented to preserve working conditions within the shallow excavation. If needed small submersible pumps should be sufficient to remove any moisture that falls within the excavation.

Where shoring is utilized for support of deep cuts additional dewatering may also be accomplished from within the excavation footprint. Hydrostatic forces should be considered in design of shoring, particularly in the event that the dewatering system needs to be turned off or fails. It should be anticipated that the base of the excavation will be at least partially saturated, soft, and that water may flow upward into the supported excavation. Pumps in the base of the excavation may be needed to control the inflow of groundwater. Construction of a permanent underdrain for any of the proposed structures may be incorporated into the system for dewatering.

The actual design of a dewatering system is beyond the scope of this report. The concepts discussed in this section should not be interpreted as a design for dewatering. Rather, they are key components that should be addressed in future design of a dewatering system.

6.2.5 Groundwater Management

If desired, an underdrain system may be constructed to prevent infiltration of groundwater into imported fill. If a free draining granular drain is installed we recommend that this drain layer be at least 12-inches thick, consist of clean (<5% passing #200 Sieve) free-draining rock. To protect against migration of fines into imported gravel, we recommend installation of a separation geofabric at the gravel-soil interface.

The Owner/Engineer may also consider the use of a geocomposite (drain-net) in place of a gravel drain. In addition to minimizing the potential for upward flow of groundwater a geocompsite consisting of a drainage "core" and non-woven geotextile will also provide separation and stability for compaction of the lower lifts of structural fill.

The contractor should be aware of the potential for groundwater drawdown to impact existing berms (sewage lagoons) to the north of the proposed construction. Excavation shoring and dewatering systems used during construction should be designed so as to minimize drawdown of groundwater beneath existing structures and embankments. Provisions should be made by the contractor to monitor existing berms during dewatering activities. The contractor could also utilize shoring that is designed to withstand hydrostatic forces from outside the excavation while managing groundwater on the inside of the excavations as necessary.

6.2.6 Structural Fill and Compaction

Where utilized, all fill placed for the support of structures, flatwork or pavements, should consist of structural fill. Structural fill should be comprised of pit run non-expansive granular fill. In all cases, structural fill should be relatively free of vegetation and debris, and contain no rocks larger than 4 inches in nominal size (6 inches in greatest dimension). If conventional footings are used and foundation excavation/over-excavation extends into native fine-grained soils we recommend the use of nonwoven geotextile fabric for stabilization and separation before placement of granular structural fill; a separation fabric is not required for structures supported on deep foundations.

All structural fill should be placed in maximum 6-inch loose lifts if compacted by small hand-operated compaction equipment, maximum 8-inch loose lifts if compacted by light-duty rollers, and maximum 12-inch loose lifts if compacted by heavy duty compaction equipment that is capable of efficiently compacting the entire thickness of the lift. Additional lift thickness may be permitted by IGES provided the contractor can demonstrate sufficient compaction can be achieved with the methods used. We recommend that all structural fill be compacted on a horizontal plane, unless otherwise approved by IGES. Structural fill placed beneath footings and pavements should be compacted to at least 95 percent of the MDD as determined by ASTM D-1557. The moisture content should be within 2% of the Optimum Moisture Content (OMC) for all structural fill. Prior to placing any fill, the excavations should be observed by IGES to confirm that unsuitable materials have been removed. In addition, proper grading should precede placement of fill, as described in the General Site Preparation and Grading subsection of this report.

All utility trenches backfilled below pavement sections, curb and gutter and concrete flatwork, should be backfilled with structural fill compacted to at least 95 percent of the MDD as determined by ASTM D-1557. All other trenches, including landscape areas, should be backfilled and compacted to approximately 90 percent of the MDD (ASTM D-1557).

Specifications from governing authorities having their own precedence for backfill and compaction should be followed where more stringent.

6.3 FOUNDATIONS

6.3.1 Clarifier and Bioreactor Complex

As mentioned in the General Conclusions, it is our recommendation the proposed clarifiers, bioreactors and the RAS/WAS buildings be designed using deep foundation system. Though several deep foundation alternatives may be acceptable, it is our opinion that driven piles will be the most efficient to install at this site. The exact elevation of the foundations has not yet been determined, but we understand they will be within ten feet of the existing ground surface. Prior to installing piles we recommend that the site be grubbed and that a relatively thin section of structural fill be placed to create a stable working surface.

Soil placed below the foundations and slabs should consist of compacted structural fill. Structural fill placed beneath foundations should meet the requirements outlined previously in Section 6.2.6. Based on prior experience with similar facilities we anticipate that the base of these treatment structures will consist of a thick concrete slab which will be reinforced and function as a large mat supported by deep foundations.

6.3.2 Headworks\Influent Pump Station Buildings

We understand the base of proposed headworks and influent pump station buildings are to be located approximately 18 feet below the current site grade. Based on the proposed layout of the headworks building in conjunction with our field observations and laboratory data, the building would experience settlement greater than one inch if founded on conventional footings. We recommend that the buildings be supported with a deep foundation system to mitigate excessive settlement of the structures. While other deep foundation alternatives may also be feasible, we have performed a preliminary design with driven pipe pile foundations starting near the surface. Soft soils will be encountered at the base of the proposed headworks excavation and will need to be stabilized to allow for mobility of equipment and personnel. A clean, coarse, angular gravel or gravel/cobble mixture (2-6 in. diameter) should be worked into the subgrade for this purpose. We anticipate that 2-3-ft of stabilization gravel/cobbles will be needed to support equipment and personnel during pile installation. The top 12-inches of this zone should consist of clean (<5% passing the #200 sieve) gravel having a maximum particle size ≤ 1-1/2 inch. Dewatering measures could also be designed to assist in stabilization of the excavation during construction.

6.3.3 Deep Foundation Alternatives

There are several deep foundation alternatives that could also be acceptable for use in support of the proposed structures. Driven piles, helical piers, micropiles, cast-in-place piles or driven piles are examples of systems that may be successfully implemented. We understand that a site fill of up to 10 feet above the existing grade will be placed around the structures during/after construction. The load from fill placed around the structures will cause excessive settlement of the structures unless proper support is provided. In order to provide required support the deep foundation system will need to extend past the near surface soft clay layers into the deeper granular soils in order to develop sufficient tip resistance. In addition, the downdrag forces imposed by the settlement beneath fill placed after construction of facilities should be accounted for in the foundation design.

Based on the installation time, size, and assumed load requirements of the proposed structures, it is our opinion that driven piles are best alternative to support proposed construction. Conceptual design for driven piles has been developed and is included in Appendix D.

6.3.3.1 Driven Piles

Driven piles should consist of at least 50 ksi steel. The option selected for evaluation consisted of a 12.75” outer diameter pile with a wall thickness sufficient to withstand the installation stresses. To protect against uplift (buoyancy) forces and to provide additional lateral resistance concrete is often used to fill the piles. In addition, rebar may be placed within the concrete to create a positive connection to the foundation of the building for uplift resistance. Alternatively, the piles may be extended into the foundation elements or steel plates with studs may be welded to the top of the piles to provide the connection. A structural engineer should be consulted for the design of the connection in association with the floor slab of each structure.

We have assumed that all of the buildings will be uniformly supported due to the anticipated thickness and rigidity of their floor slabs. All of the buildings will be located within 5 feet of the current ground surface with the exception of the headworks building, secondary clarifiers, and influent pump station; the base elevation of these structures will be located approximately 10 to 18 feet below the current ground surface. After the buildings are constructed approximately 10 feet of fill will be placed around or on top the proposed structures. The placement of the fill adjacent to structures will result in consolidation of the underlying soils. The consolidation may cause additional loads on the piles (as a downdrag force) and can impose undesired stresses on structures or pipe runs if they are not supported by a deep foundation system.

Based on the conceptual construction and grading information provided along with our assumptions regarding building loads, piles should be installed in a grid pattern with maximum center-to-center spacing of 8-ft in both directions. If equipment or operational/dynamic loads are expected at discrete locations within the footprint of proposed structures, additional deep foundation elements may be required in those locations. In our analysis we assumed a relatively thick foundation, and assumed that these foundations are rigid enough to support the load under the given spacing.

Given the relatively consistent soil stratigraphy observed in our investigations, we anticipate the majority of the piles will be driven to relatively uniform tip elevations. Figure D-1 located in Appendix D shows the allowable capacity vs. depth graphs and charts if the piles were installed to an approximate toe elevation of 4387 ft. Care should be exercised in using the capacities directly from the graph due to possible differences in the bearing layer at the tip of the pile. Due to the size of the Bioreactors, the soil below the central portions of structures will not be influenced by the settlement below fill placed around the building exterior, therefore the central piles will need to be installed only to an approximate tip elevation of 4397 ft, where an upper layer of granular soils exists. Figure D-2 located in Appendix D shows the allowable capacity vs. depth graph and charts if the piles were installed to that tip elevation. If a lateral load is anticipated, a structural engineer should be consulted to assess the structural component of the pile sufficient to resist the anticipated loads. Additional details of pile design, including lateral and uplift capacity are included in Appendix D.

The values listed in Appendix D only reflect the anticipated loads at the time of this report. If different capacities are required, IGES should be consulted for evaluation of the allowable pile resistances for the differing scenarios. It should be noted that our investigations were performed only within the original planned area for the treatment facility. The subsurface soils in the areas located to the east of the initial plant area were not investigated as part of this study, therefore the tip elevations listed above may vary in these areas. We recommend that additional explorations are performed to verify the existence of and depth to the granular soils in other areas of planned construction.

Construction of driven plies should also be accompanied by an appropriate testing program. Two percent of the piles or a minimum of two piles per structure should be tested using either static or dynamic testing.

6.4 SETTLEMENT

6.4.1 Consolidation Settlement

Settlement of structures that are founded on driven piles is anticipated to be less than 1 inch, with differential settlement less that ½ the total settlement. However, due to the placement of the fill around the new structures associated with the treatment facility, excessive settlement is likely in any of the unsupported areas between structures. This settlement could affect the regular operations if pipe runs are not also supported. Excessive movement of fill would likely induce significant stresses on pipe and pipe connections to structures that are supported by deep foundations. The anticipated settlement of the structures supported on driven piles is illustrated graphically on Figure D-5.

Support of structures and pipe runs by using deep foundations is the recommended method of settlement mitigation. As an alternative, preloading of the site using a 10-foot thick zone of imported fill was analyzed to estimate the expected settlement and time required to achieve 95% consolidation settlement. Using the Settle 3D v. 2.016 Software by Rocscience a settlement model was developed to estimate the magnitude of settlement and expected time required to complete settlement. Based on our model of the original plant layout and the assumed load, the site is projected to settle approximately 34 inches under a 10 ft soil preload. Approximately 520 days would be required in order to reach 95% consolidation settlement. Our model also predicted up to 8 inches of post-construction settlement depending on the loading and foundation elevation of proposed structures.

As another alternative we assessed the construction to include dewatering and sequenced overexcavation and placement of 15 feet of imported fill soils below existing site grade. Preloading of the site was then accomplished using native soils placed on top of imported fill. This alternative was considered in order that the majority of consolidation settlement would be complete in the time frame required for construction and reduce post-construction settlement to acceptable levels. In this scenario approximately 30 inches of pre-construction settlement is expected with up to 4 inches of site soil rebound when construction dewatering measures are terminated. Additional settlement and rebound would be expected if dewatering is utilized during operations, maintenance or to facilitate future construction and expansion of the plant. The conceptual construction stages and assumed schedule utilized in this sequenced overexcavation and preloading scenario are shown in Appendix D.

We anticipate that settlement tolerances for proposed facilities and piping will require selection and design of deep foundation alternatives. Structures supported by properly designed and constructed deep foundation systems experience less settlement when compared with conventional foundations in similar site conditions. If the preloading option is still desired, IGES will need to work with the contractor to assess the final construction schedule and determine if it should be modified to minimize the potential impacts of settlement. Additional monitoring, as outlined in the following section, would also need to be incorporated into construction plans and schedules.

6.4.1.1 Settlement Monitoring

If a significant amount of fill is placed to bring the current site elevations to final grade or preload is used to mitigate settlement, we recommend that a settlement monitoring system be implemented both during the preload and construction phases of the project. The monitoring will likely consist of a combination of top level survey, monometers, vibrating wire piezometers, and magnetic extensometers. If surcharge is used in conjunction with a shallow foundation system, the fill should be placed and monitored until data shows that primary consolidation is complete.

During the preload phase of fill placement, measurements should be reported for settlement both at the top of the fill and near the depth of the proposed foundations. The measurement should be recorded by, or supplied to, IGES Inc. to determine the degree of settlement at the time of the readings and to predict completion of the settlement. The time required and magnitude of total settlement could vary and if the unit weights and thickness of the fill vary from our stated assumptions.

If a preloading alternative for settlement mitigation is selected, monitoring should be conducted during the construction phase of the project to confirm the design assumptions.

6.5 EARTH PRESSURES AND LATERAL RESISTANCE

Lateral forces imposed upon conventional foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footing and the supporting soil. In determining the frictional resistance against concrete, a coefficient of friction of 0.30 for native clayey soils or 0.55 for imported granular fill may be used.

Ultimate lateral earth pressures from native soils and *granular* backfill acting against retaining walls and buried structures may be computed from the lateral pressure coefficients or equivalent fluid densities presented in Table 2.

Table 2 – Lateral Forces for Native and Imported Materials

Condition	**Native Clay Soil**		**Imported Granular Fill**	
	Lateral Pressure Coefficient	**Equivalent Fluid Density (pcf)**	**Lateral Pressure Coefficient**	**Equivalent Fluid Density (pcf)**
		Static		
Active (K_a)	0.33	38	0.26	34
At-rest (K_0)	0.50	58	0.41	53
Passive (K_p)	3.00	345	3.85	500
		Seismic		
Pseudo-static (K_{AE} - seismic)	0.44	51	0.35	46

These coefficients and densities assume no buildup of hydrostatic pressures. The force of the water should be added to the presented values if hydrostatic pressures are anticipated. Clayey soils drain poorly and may swell upon wetting, thereby greatly increasing lateral pressures acting on earth retaining structures; therefore, clayey soils should not be used as retaining wall backfill. Backfill should consist of either previously imported sandy soil or imported material with an Expansion Index (EI) less than 20.

For seismic analyses, the *active* earth pressure coefficient provided in the table is based on the Mononobe-Okabe pseudo-static approach and only accounts for the dynamic horizontal thrust produced by ground motion. Hence, the resulting dynamic thrust pressure *should be added* to the static pressure to determine the total pressure on the wall. The pressure distribution of the dynamic horizontal thrust may be closely approximated as an inverted triangle with stress decreasing with depth and the resultant acting at a distance approximately 0.6 times the loaded height of the structure, measured upward from the bottom of the structure.

The seismic *at-rest* earth pressure coefficient provided in the table is based on studies conducted by Wood (1973). This coefficient only accounts for the dynamic horizontal thrust produced by ground motion, and the magnitude of the resulting parabolic-type loading may be roughly approximated by assuming a uniform pressure distribution. This results in a dynamic thrust equal to the product of the coefficient, the soil unit weight, and the square of the loaded height of the structure. This load can be assumed to act at a distance of approximately 0.6 times the loaded height of the structure, measured upward from the bottom of the structure. The dynamic thrust *should be added* to the static (i.e., gravity) force to determine the total load on the wall.

Structural design which incorporates these values should use an appropriate factor of safety against overturning and sliding; a value of 1.5 is typical. Additionally, if passive resistance is calculated in conjunction with frictional resistance, the passive resistance should be reduced by one half.

Overcompaction adjacent to walls should be avoided. Resisting passive earth pressure from soils subject to frost or heave, or otherwise above prescribed minimum depths of embedment, should usually be neglected in design.

6.6 CONCRETE SLAB-ON-GRADE CONSTRUCTION

To minimize settlement and cracking of slabs, and to aid in drainage beneath the concrete floor slabs, all concrete slabs should be founded on a minimum 4-inch layer of compacted gravel overlying structural fill. The gravel should consist of free draining gravel or road base with a 3/4-inch maximum particle size and no more than 5 percent passing the No. 200 mesh sieve. The layer should be compacted to at least 95 percent of the MDD as determined by ASTM D-1557. Other earth materials not meeting the criteria above may be suitable for construction; alternate materials should be evaluated on a case-by-case basis and should be approved by IGES.

All concrete slabs should be designed to minimize cracking as a result of shrinkage. Consideration should be given to reinforcing the slab with a welded wire fabric, re-bar, or fibermesh. Slab reinforcement should be designed by the structural engineer.

6.7 MOISTURE PROTECTION AND SURFACE DRAINAGE

It is our understanding that the proposed depth of the foundations of most structures are proposed to be located above the current site grade. In order to limit water infiltration into the foundation soils, we recommend that free draining granular fill be placed above the native clays that should extend to the footing level. If the site is to be preloaded, the granular fill should extend a minimum of 40 inches above the proposed elevation of the footings to allow the footings to bear on the granular fill after the consolidation of the soils has occurred . A filter fabric should be used as a separation layer between the granular fill and the native clayey soils.

6.8 PRELIMINARY SOIL CORROSION POTENTIAL

As mentioned previously current construction plans call for a significant amount of fill to be placed at the site. Most elements of proposed construction will be founded in this fill and not come in contact with native soils that exist at greater depth. The source of the imported was not known at the time of this report, therefore no preliminary corrosion evaluation could be provided on the fill materials.

Native soils were tested for preliminary soil corrosion potential. Initial testing of soluble sulfate content was performed and indicated that the native soils have a low potential for sulfate attack of concrete. Based on these results we recommend that all concrete contain Type I or Type II cement.

Metal corrosivity of the native soils was also evaluated based on the resistivity and pH tests. These results indicate that the native soils are severely corrosive to metal. Based on these results, we recommend a corrosion engineer be consulted as necessary for any piping or steel reinforcement that will be placed in direct contact with native soils below the existing site grade. Further, any imported fill should be evaluated prior to placement.

7.0 CLOSURE

7.1 LIMITATIONS

The recommendations contained in this report are based on our review of previously performed studies, limited field exploration, laboratory testing, and understanding of the proposed construction. The subsurface data used in the preparation of this report were obtained from the explorations made for this investigation. It is possible that variations in the soil and groundwater conditions could exist between the points explored. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site that are different from those described in this report, we should be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope or location of the proposed construction changes from that described in this report, IGES should be notified.

This report was prepared in accordance with the generally accepted standard of practice at the time the report was written. No warranty, expressed or implied, is made.

It is the Client's responsibility to see that all parties to the project including the Designer, Contractor, Subcontractors, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

7.2 ADDITIONAL SERVICES

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during construction. IGES staff should be on site to verify compliance with these recommendations. These tests and observations should include, but not necessarily be limited to, the following:

- Observations and testing during site preparation, earthwork and structural fill placement.
- Observation of foundation soils to assess their suitability for footing placement.
- Observation of soft/loose soils over-excavation.
- Observation of temporary excavations and shoring.
- Consultation as may be required during construction.

- Quality control and observation of concrete placement.

We also recommend that project plans and specifications be reviewed by us to verify compatibility with our conclusions and recommendations. Additional information concerning the scope and cost of these services can be obtained from our office.

We appreciate the opportunity to be of service on this project. Should you have any questions regarding the report or wish to discuss additional services, please do not hesitate to contact us at your convenience at (801) 270-9400.

8.0 REFERENCES CITED

Barker, K.S. and Barker S.W., 1993, Interim Geologic Map of the Wellsville Quadrangle, Cache County, Utah, Utah Geological Survey Contract Report 93-2, scale 1:24,000

Black, B.D., Hylland, M.D., Haller, K.M., and Hecker, S., compilers, 1999, Fault number 2352b, East Cache fault zone, central section, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 04/30/2013 10:27 AM.

Black, B.D., DuRoss, C.B., Hylland, M.D., and Hecker, S., compilers, 2004, Fault number 2521b, West Cache fault zone, Junction Hills fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 04/30/2013 10:32 AM.

ConeTec, Inc. (ConeTec), 2013, Cone Penetration Test Data, Proposed Logan Water Treatment Plant, Prepared for IGES, Inc., Unpublished Consultants Report, 21 pp (including appendices)

Federal Emergency Management Agency [FEMA], 1997, *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures*, FEMA 302, Washington, D.C.

Frankel, A., Mueller, C., Barnard, T., Perkins, D., Leyendecker, E.V., Dickman, N., Hanson, S., and Hopper, M., 1996, *National Seismic-hazard Maps: Documentation*, U.S. Geological Survey Open-File Report 96-532, June.

Hintze, L.F., 1980, Geologic Map of Utah: Utah Geological and Mineral Survey Map-A-1, scale 1:500,000.

Hintze, L.F., 1993, "Geologic History of Utah" Brigham Young University Studies, Special Publication 7, 202p

International Building Code [IBC], 2012, International Code Council, Inc.

Personius, S.F., and Scott, W.E., 1992, Surficial geologic map of the Salt Lake City segment and parts of adjacent segments of the Wasatch fault zone, Davis, Salt Lake, and Utah Counties, Utah: U.S. Geological Survey Miscellaneous Investigations Series Map I-2106, scale 1:50,000.

Sack, D. M., 2005, Geologic Map of the Clearfield 7.5' Quadrangle, Davis County, Utah, Utah Geological Survey Miscellaneous Publication (MP-05-04), 14 p., 2 pl, ISBN 1-55791-724-8.

Solomon, B.J., McCalpin, J.P., and McBride, J.A., 2001, Liquefaction Hazards for the Wellsville Quadrangle, Central Cache Valley, Utah, map scale 1:24,000.

Utah Geological Survey (UGS), 2003, Liquefaction Potential in Cache Valley, Cache County, Utah, Public Information Series 79, 2 p., 1 figure, approximate scale 1:166,700.

Scott, W.E., McCoy, W.D., Shorba, R.R., and Meyer, R., 1983, Reinterpretation of the exposed record of the last two cycles of Lake Bonneville, western United States: Quaternary Research, v.20, p. 261-285.

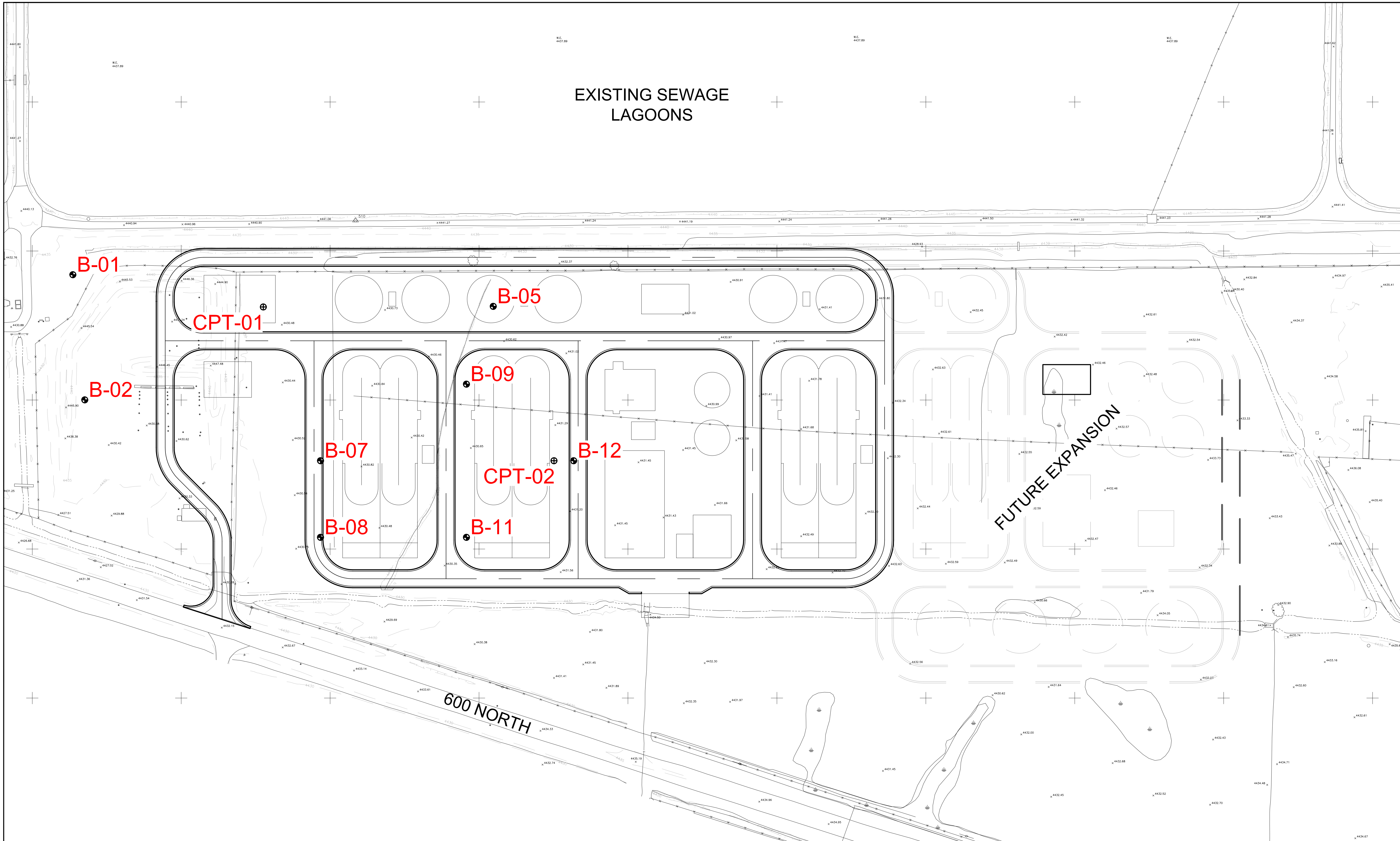
USGS (2013) U. S Seismic Design Maps Ground Motion Parameter Calculator – Version 3.0.1 (http://geohazards.usgs.gov/designmaps/us/application.php), last updated 12 July 2012, uses the International Building Code (2008 IBC) seismic hazard maps

USGS, 2012, Quaternary Fault and Fold Database of the United States, (http://earthquakes.usgs.gov/regional/qfaults), accessed March 2012

Utah Geological Survey – Selected Critical Facilities and Geologic Hazards, Davis County, Utah

Wood, J.H., 1973, "Earthquake-induced soil pressures on structures." California Institute of Technology, EERL 73-05

APPENDIX A



MARK		DATE	BY	CHK	MARK		DATE	BY	CHK
REVISIONS					REVISIONS				

CONSULTANTS:

IGES
ideas for a changing world

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GEOTECHNICAL INVESTIGATION
LOGAN WWTP
CACHE COUNTY, UTAH
SITE INVESTIGATION MAP

DESIGNED BY: JH DATE: 06/12/13		APPROVED BY: JH DATE:	
DRAWN BY: CAROLLO		PLOT SCALE	1=1
CHECKED BY: JH DATE: 05/14/14		DWG SCALE	1"=xx'
PROJECT: 00823-012		REVISION NO:	1
DRAWING NO. -		PLATE	A-1

DATE	
STARTED:	2/4/13
COMPLETED:	2/4/12
BACKFILLED:	2/4/12

Geotechnical Investigation
Logan WWTP
Cache County, Utah
Project Number 00823-012

IGES Rep: DB
Rig Type: CME 85
Boring Type:

BORING NO:
B-01
Sheet 1 of 2

LOCATION
NORTHING 0.00000 EASTING 0.00000 ELEVATION 0.00

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT 10 20 30 40 50 60 70 80 90	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit) 10 20 30 40 50 60 70 80 90
0	0				FILL - Silty GRAVEL									
	5	⧗		CH	Fat CLAY - medium stiff, moist, grey	3 4 7	7	●	82	37				●
3	10			CL	Lean CLAY - medium stiff, moist, brown and grey mottling, sand lenses									
4			▽											
	15	⧗			- wet	2 3 6	6	●	84	37				●
6	20	⊠		CH	Fat CLAY - soft, wet, grey to dark grey	0 1 0 2	1	●						
7					- very soft									
	25	⧗				0 2 1	2	●	56	76	93			●
9		⊠		CL	Sandy Lean CLAY - medium stiff, wet, dark grey	0								

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

SAMPLE TYPE
- ⊠ - 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- ⧗ - 3.25" O.D./2.42" I.D. U SAMPLER
- ▨ - 3" O.D. THIN-WALLED SHELBY SAMPLER
- ▯ - GRAB SAMPLE
- ▭ - 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- ◩ - 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
A - 2a

DATE	
STARTED:	2/4/13
COMPLETED:	2/4/12
BACKFILLED:	2/4/12

Geotechnical Investigation
Logan WWTP
Cache County, Utah
Project Number 00823-012

IGES Rep: DB
Rig Type: CME 85
Boring Type:

BORING NO: **B-01**

LOCATION
NORTHING 0.00000 EASTING 0.00000 ELEVATION 0.00

DEPTH (FEET)	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
30			2 3	5					
35	SP-SC	Poorly Graded SAND with clay - loose, wet, grey, fine sand	2 5 5	4	101	24			
40	CL	Lean CLAY with sand - medium stiff, wet, grey, fine sand	1 3 8	11		25	78		
45	SM	Silty SAND - medium dense, wet, grey, fine sand	4 5 8	8	103	24	46		
50	SM	Silty SAND - loose, wet, grey	0 1 2 2	3					
		Bottom of Boring @ 51.5 Feet							

Column headings: METERS, FEET, SAMPLES, WATER LEVEL, GRAPHICAL LOG, UNIFIED SOIL CLASSIFICATION, MATERIAL DESCRIPTION, N, N*, SPT BLOW COUNT 10 20 30 40 50 60 70 80 90, Dry Density(pcf), Moisture Content %, Percent minus 200, Liquid Limit, Plasticity Index, Moisture Content and Atterberg Limits (Plastic Limit, Moisture Content, Liquid Limit) 10 20 30 40 50 60 70 80 90

Depth scale: METERS 10, 11, 12, 13, 14, 15, 16, 17, 18; FEET 30, 35, 40, 45, 50, 55

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
A - 2b

DATE	
STARTED:	2/5/13
COMPLETED:	2/5/12
BACKFILLED:	2/5/12

Geotechnical Investigation
Logan WWTP
Cache County, Utah
Project Number 00823-012

IGES Rep: DB
Rig Type: CME 85
Boring Type:

BORING NO:
B-02
Sheet 1 of 3

LOCATION
NORTHING 0.00000 EASTING 10.00000 ELEVATION 0.00

Depth (meters)	Depth (feet)	Samples	Water Level	Unified Soil Classification	Material Description	N	N*	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	0				FILL							
1.5	5	2" split spoon		CH	Fat CLAY - medium stiff, dark grey, moist, some root matter	1 3 3 5	6					
2.5				CL	Lean CLAY - medium stiff, brown with grey mottling, moist, some black sand sized particles							
3	10	3.25" U sampler				3 4 8	7	89	32			
4			▽									
4.5	15	2" split spoon			- wet	1 1 1 3	2					
5.8				CH	Fat CLAY - soft, wet, grey							
6	20	2" split spoon				0 0 1 1	1	61	67			
7.6	25	3.25" U sampler				1 1 1	2	58	72	99	79	52
9					- no recovery							

SPT BLOW COUNT: 10 20 30 40 50 60 70 80 90

Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit: 10 20 30 40 50 60 70 80 90

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
A - 3a

DATE	
STARTED:	2/5/13
COMPLETED:	2/5/12
BACKFILLED:	2/5/12

Geotechnical Investigation
Logan WWTP
Cache County, Utah
Project Number 00823-012

IGES Rep: DB
Rig Type: CME 85
Boring Type:

BORING NO:
B-02
Sheet 2 of 3

LOCATION
NORTHING 0.00000 EASTING 10.00000 ELEVATION 0.00

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits
	30					Clayey SAND - loose to medium dense, wet, grey									
10															
					SP-SM	Poorly Graded SAND with silt - medium dense, wet, tan									
	35						1 2 8 12	10	●		27	8			●
11															
12					CL	Lean CLAY with sand - medium stiff, wet, tan									
	40									103	24		32	13	●
13															
					CL	Sandy Lean CLAY - medium stiff, wet, tan									
	45						5 5 6 9	11	●						
14															
15					ML	Sandy SILT - medium stiff, wet, tan, 6" layers of sand									
	50						5 7 9 18	16	●						
16															
	55						3 5 8 10	13	●		26	56	24	3	●
17					CL	Sandy Lean CLAY - stiff, wet, olive, interbedded clay and sand layers									
18															

SPT BLOW COUNT scale: 10 20 30 40 50 60 70 80 90
Plastic Limit / Moisture Content / Liquid Limit scale: 10 20 30 40 50 60 70 80 90

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

IGES®

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
A - 3b

DATE		
STARTED:	2/5/13	
COMPLETED:	2/5/12	
BACKFILLED:	2/5/12	

Geotechnical Investigation
Logan WWTP
Cache County, Utah
Project Number 00823-012

IGES Rep: DB
Rig Type: CME 85
Boring Type:

BORING NO:
B-02
Sheet 3 of 3

LOCATION
NORTHING 0.00000 EASTING 10.00000 ELEVATION 0.00

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT 10 20 30 40 50 60 70 80 90	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit, Moisture Content, Liquid Limit) 10 20 30 40 50 60 70 80 90
	60														
19															
20	65				SC	Clayey SAND - stiff, wet, olive grey	0 3 21 12	24							
						Bottom of Boring @ 66.5 Feet									
21	70														
22															
23	75														
24	80														
25															
26	85														
27															

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

IGES®

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
A - 3c

DATE		
STARTED:	2/7/13	
COMPLETED:	2/7/12	
BACKFILLED:	2/7/12	

Geotechnical Investigation
Logan WWTP
Cache County, Utah

Project Number 00823-012

IGES Rep: NB
Rig Type: CME 85
Boring Type:

BORING NO: **B-05**
Sheet 1 of 3

LOCATION
NORTHING 0.00000 EASTING 20.00000 ELEVATION 0.00

DEPTH (METERS)	DEPTH (FEET)	SAMPLES	WATER LEVEL	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	0				FILL - TOPSOIL - Lean CLAY - brown							
				CH	Fat CLAY - medium to stiff, moist, brown							
2	5	Split spoon				2 5 7 10	12		28		50	28
3	10	U sampler		CL	Lean CLAY - medium to stiff, moist, brown	2 7 5	7					
4			∇									
5	15	Split spoon		CL	Lean CLAY - soft, wet to moist, brown to grey	1 2 2 4	4					
6	20	Shelby		CH	Fat CLAY - soft, to very soft, wet, grey				67	99	81	54
7	25	Shelby		CH	Fat CLAY - medium stiff, to stiff, wet, grey			88	29	80	42	16
8				CL	Lean CLAY with sand - medium stiff, wet, grey							
9		Split spoon			Lean CLAY - soft, wet, grey							

SPT BLOW COUNT: 10 20 30 40 50 60 70 80 90

Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit — 10 20 30 40 50 60 70 80 90

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
▼ - MEASURED ∇ - ESTIMATED

IGES®

Plate
A - 4a

DATE	
STARTED:	2/7/13
COMPLETED:	2/7/12
BACKFILLED:	2/7/12

Geotechnical Investigation
Logan WWTP
Cache County, Utah
Project Number 00823-012

IGES Rep: NB
Rig Type: CME 85
Boring Type:

BORING NO: **B-05**

LOCATION
NORTHING 0.00000 EASTING 20.00000 ELEVATION 0.00

DEPTH (FEET)	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
30			2 4 5	9					
35	SM	Layered Silty SAND - SILT - CLAY - grey brown Silty Sand, brown grey Clay	0 0 2 3	2					
40	ML	Sandy SILT to silt with sand - soft to medium stiff, wet, brown	4 6 19	13	108	23			
45		- no recovery	0 0 1 5	1					
50	SC	Clayey SAND - medium dense, wet, grey brown	5 8 7	6					
55	SM	Silty SAND with gravel - medium dense, grey/brown, 3/8" gravel	9 22 16	15					
60	ML	SILT - soft, wet, grey	5						

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
A - 4b

DATE		
STARTED:	2/7/13	
COMPLETED:	2/7/12	
BACKFILLED:	2/7/12	

Geotechnical Investigation
Logan WWTP
Cache County, Utah
Project Number 00823-012

IGES Rep: NB
Rig Type: CME 85
Boring Type:

BORING NO:
B-05
Sheet 3 of 3

LOCATION
NORTHING 0.00000 EASTING 20.00000 ELEVATION 0.00

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT 10 20 30 40 50 60 70 80 90	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit, Moisture Content, Liquid Limit) 10 20 30 40 50 60 70 80 90
	60						5 5	7		89	32	96	34	10	
19															
20	65				CH	Fat CLAY - soft to medium stiff, moist to wet, grey	5 10 9	11							
21	70				CH	Fat CLAY - medium stiff to stiff, moist, grey	3 4 8	7		83	39	98	53	30	
22						Bottom of Boring @ 71.5 Feet									
23	75														
24	80														
25															
26	85														
27															

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

IGES®

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate

A - 4c

DATE		
STARTED:	2/8/13	
COMPLETED:	2/8/12	
BACKFILLED:	2/8/12	

Geotechnical Investigation
Logan WWTP
Cache County, Utah
Project Number 00823-012

IGES Rep: NB
Rig Type: CME 85
Boring Type:

BORING NO: **B-07**

LOCATION: NORTHING 0.00000 EASTING 30.00000 ELEVATION 0.00

Depth (feet)	Samples	Water Level	USCS	MATERIAL DESCRIPTION	N	N*	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0				TOPSOIL							
0.5			CH	Fat CLAY - stiff to very stiff, moist, brown							
5	U sampler				2 7 16	12					
9.5			CH	Fat CLAY - medium stiff, moist, brown							
10	Shelby						85	35	99	52	27
11				Layer of Silty SAND - dense, moist, fine sand							
11.5			CH	Fat CLAY - medium stiff, moist, brown							
13		▽									
15	U sampler				2 4 4	6					
19			CL	Lean to Fat CLAY - soft to very soft, wet to moist, grey							
20	U sampler				0 1 1	2					
24			CL	Lean CLAY - soft to very soft, wet, greenish grey							
25	U sampler				2 3 5	6					
29	Split spoon		SM	Silty SAND - loose to very loose, wet, grey brown	2						

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

IGES®

Plate

A - 5a

DATE		
STARTED:	2/8/13	
COMPLETED:	2/8/12	
BACKFILLED:	2/8/12	

Geotechnical Investigation
Logan WWTP
Cache County, Utah
Project Number 00823-012

IGES Rep: NB
Rig Type: CME 85
Boring Type:

BORING NO:
B-07

LOCATION
NORTHING 0.00000 EASTING 30.00000 ELEVATION 0.00

Depth (Feet)	USCS	MATERIAL DESCRIPTION	N	N*	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
30	CL	Lean CLAY - soft to medium stiff, wet, grey	2 2 2	4		27 27	42 94		
35	SP	Poorly Graded SAND - loose to medium stiff, wet, grey brown	0 4 12	6		29	4		
40	SM	Silty SAND - very loose to loose, wet, brown, fine sand	2 5 7 10	12					
45	SM	Silty SAND - loose to medium dense, wet, brown grey, fine sand	2 8 12 19	20					
50	SM	Silty SAND - medium dense to dense, wet, brown grey, fine sand	5 10 30	16	91	31	15		
51.5		Bottom of Boring @ 51.5 Feet							

Depth scale: Meters 10–18; Feet 30–55.

SPT BLOW COUNT: 10 20 30 40 50 60 70 80 90

Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit; 10 20 30 40 50 60 70 80 90

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

IGES®

Plate
A - 5b

DATE	
STARTED:	2/5/13
COMPLETED:	2/6/12
BACKFILLED:	2/6/12

Geotechnical Investigation
Logan WWTP
Cache County, Utah

Project Number 00823-012

IGES Rep: DB
Rig Type: CME 85
Boring Type:

BORING NO:
B-08
Sheet 1 of 2

LOCATION
NORTHING 0.00000 EASTING 40.00000 ELEVATION 0.00

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	0				TOPSOIL							
				CL	Lean CLAY - stiff, moist, brown							
	5	3" O.D. Thin-walled Shelby										
3	10	2" O.D. Split spoon			- medium stiff, rust staining	1 3 3 3	6					
4			▽									
	15	3.25" O.D. U sampler		CH	Fat CLAY - medium stiff, wet, dark grey	2 3 2	4	71	51	98	69	46
6	20	2" O.D. Split spoon				0 0 0 0	0					
	25	3.25" O.D. U sampler						56	74		76	48
9		2" O.D. Split spoon			- stiff							

SPT BLOW COUNT: 10 20 30 40 50 60 70 80 90

Moisture Content and Atterberg Limits: Plastic Limit — Moisture Content — Liquid Limit; 10 20 30 40 50 60 70 80 90

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

IGES®

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
A - 6a

DATE	
STARTED:	2/5/13
COMPLETED:	2/6/12
BACKFILLED:	2/6/12

Geotechnical Investigation
Logan WWTP
Cache County, Utah
Project Number 00823-012

IGES Rep: DB
Rig Type: CME 85
Boring Type:

BORING NO:
B-08
Sheet 2 of 2

LOCATION
NORTHING 0.00000 EASTING 40.00000 ELEVATION 0.00

Depth (Meters)	Depth (Feet)	Unified Soil Classification	Material Description	N	N*	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
	30						38		52	33
	34	SP	Poorly Graded SAND - wet, grey	0 0 0 0	0		25	4		
	40			3 8 18	26					
	41	SM	Silty SAND - medium dense, wet, grey, fine sand							
	45			3 6 11 11	17					
	50			3 6	9					
	50.5		Bottom of Boring @ 50.5 Feet							

SPT BLOW COUNT: 10 20 30 40 50 60 70 80 90

Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit: 10 20 30 40 50 60 70 80 90

Depth scale: METERS 10, 11, 12, 13, 14, 15, 16, 17, 18; FEET 30, 35, 40, 45, 50, 55

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

IGES®

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
A - 6b

DATE		
STARTED:	2/8/13	
COMPLETED:	2/8/12	
BACKFILLED:	2/8/12	

Geotechnical Investigation
Logan WWTP
Cache County, Utah
Project Number 00823-012

IGES Rep: NB
Rig Type: CME 85
Boring Type:

BORING NO:
B-09
Sheet 1 of 2

LOCATION
NORTHING 0.00000 EASTING 50.00000 ELEVATION 0.00

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	0				TOPSOIL							
				CH	Fat CLAY - stiff, moist to wet, brown							
	5				- no recovery							
3	10			CH	Fat CLAY - medium stiff to stiff, moist, wet, brown	3 4 6	7					
4			▽									
	15			CH	Fat CLAY - medium stiff to soft, wet, brown			79	43	96	72	45
6	20			CH	Fat CLAY - soft to very soft, wet, grey	1 1 2	2					
	25			SC	Clayey SAND - loose, wet, greenish grey	3 4 7	7	81	39	39	45	19
9				CL	Lean CLAY - medium stiff, wet, grey	3						

SPT BLOW COUNT: 10 20 30 40 50 60 70 80 90

Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit: 10 20 30 40 50 60 70 80 90

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

IGES®

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
A - 7a

DATE	
STARTED:	2/8/13
COMPLETED:	2/8/12
BACKFILLED:	2/8/12

Geotechnical Investigation
Logan WWTP
Cache County, Utah
Project Number 00823-012

IGES Rep: NB
Rig Type: CME 85
Boring Type:

BORING NO:
B-09
Sheet 2 of 2

LOCATION
NORTHING 0.00000 EASTING 50.00000 ELEVATION 0.00

DEPTH (METERS)	DEPTH (FEET)	SAMPLES	WATER LEVEL	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
	30					4 7 2	11					
10												
11	35			SM	Silty SAND - loose, wet, greyish brown, fine to medium sand	1 6 7 4	13					
12	40			CL	Lean CLAY - stiff, moist to wet, grey green	5 14 13	14	113	18		36	19
13												
14	45			CL-ML	Sandy Silty CLAY - medium stiff to soft, wet, grey/brown, with fine sand	1 2 5 8	7					
15	50			SC	Clayey SAND - loose, wet, brown, fine sand	3 2 3 6	5					
16					Bottom of Boring @ 51.5 Feet							
17	55											
18												

SPT BLOW COUNT: 10 20 30 40 50 60 70 80 90

Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit — 10 20 30 40 50 60 70 80 90

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

IGES®

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
- MEASURED - ESTIMATED

Plate
A - 7b

DATE	
STARTED:	2/6/12
COMPLETED:	2/6/12
BACKFILLED:	2/6/12

Geotechnical Investigation
Logan WWTP
Cache County, Utah

Project Number 00823-012

IGES Rep: DB/NB
Rig Type: CME 85
Boring Type:

BORING NO: **B-11**

Sheet 1 of 2

LOCATION

NORTHING 0.00000 EASTING 60.00000 ELEVATION 0.00

Depth (Meters)	Depth (Feet)	Samples	Water Level	Unified Soil Classification	Material Description	N	N*	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	0			CL	Lean CLAY - medium stiff, moist, brown							
1.5–2.1	5–7	2" Split Spoon				2, 5, 5, 7	10					
2.7	9			CH	Fat CLAY - medium stiff, moist, brown							
3	10	3.25" U Sampler				2, 3, 4	5					
4	~13		▽ (estimated)									
4.6	15	3" Shelby		CH	Fat CLAY - medium stiff, moist, brown to grey			72	50	99	70	43
5.2	17			CH	Fat CLAY - medium stiff, wet, grey							
6	20	3.25" U Sampler										
7.6	25	2" Split Spoon		CH	Fat CLAY with sand - medium stiff, moist, grey	2, 2, 3, 5	5		39			
9	~29.5	3.25" U Sampler		ML	SILT with sand - dense, moist/wet, grey, fine grained sand	3						

SPT BLOW COUNT: 10 20 30 40 50 60 70 80 90

Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit — 10 20 30 40 50 60 70 80 90

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

IGES®

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate

A - 8a

DATE		
STARTED:	2/6/12	
COMPLETED:	2/6/12	
BACKFILLED:	2/6/12	

Geotechnical Investigation
Logan WWTP
Cache County, Utah
Project Number 00823-012

IGES Rep: DB/NB
Rig Type: CME 85
Boring Type:

BORING NO:
B-11
Sheet 2 of 2

LOCATION
NORTHING 0.00000 EASTING 60.00000 ELEVATION 0.00

DEPTH (METERS)	DEPTH (FEET)	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits
	30						15 17	16							
10															
11	35				SM	Silty SAND - medium dense, wet, grey	2 6 12 10	18							
12	40				ML	Sandy SILT - medium dense, wet, brown	5 6 12 12	18							
13															
14	45				SM	Silty SAND - medium dense, wet, brown/grey	1 6 17	9		104	23	34			
15	50				SM	Silty SAND - medium dense to loose, wet, brownish grey	3 4 8 15	12							
16						Bottom of Boring @ 51.5 Feet									
17	55														
18															

SPT BLOW COUNT scale: 10 20 30 40 50 60 70 80 90

Plastic Limit — Moisture Content — Liquid Limit scale: 10 20 30 40 50 60 70 80 90

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
A - 8b

DATE	
STARTED:	2/6/12
COMPLETED:	2/7/12
BACKFILLED:	2/7/12

Geotechnical Investigation
Logan WWTP
Cache County, Utah

Project Number 00823-012

IGES Rep: NB
Rig Type: CME 85
Boring Type:

BORING NO: **B-12**

Sheet 1 of 2

LOCATION
NORTHING 0.00000 EASTING 70.00000 ELEVATION 0.00

DEPTH (FEET)	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0		TOPSOIL - FILL							
	CH	Fat CLAY - medium stiff to soft, wet, brown, sand seam							
5			3, 9, 16	13	99	27		50	28
10	CH	Fat CLAY - soft, wet, brown	3, 5, 7	7					
15					82	39			
	CH	Fat CLAY - soft to medium stiff, wet, brown/grey	2, 4, 7	7					
20	CH	Fat CLAY - soft, wet, grey	0, 0, 1, 1	1					
25	CH	Fat CLAY - soft to medium stiff, wet, grey, sandy clay seams			91	32	90	60	40
	SM	Silty SAND - medium dense, wet, grey/brown, 3/8" gravel							

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

SAMPLE TYPE
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
- MEASURED - ESTIMATED

IGES®

Plate A - 9a

DATE	
STARTED:	2/6/12
COMPLETED:	2/7/12
BACKFILLED:	2/7/12

Geotechnical Investigation
Logan WWTP
Cache County, Utah
Project Number 00823-012

IGES Rep: NB
Rig Type: CME 85
Boring Type:

BORING NO: **B-12**
Sheet 2 of 2

LOCATION
NORTHING 0.00000 EASTING 70.00000 ELEVATION 0.00

DEPTH METERS	DEPTH FEET	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
	30			1 4 8	12					
10										
	35	SM	Silty SAND - loose, wet, grey/brown	0 2 3 5	5					
11										
12		SP-SM	Poorly Graded SAND with silt - medium dense, brown, fine sand							
	40			4 5 8 11	13					
13										
	45	SP-SM	Poorly Graded SAND with silt - wet, grey/brown, fine sand	3 3 7 8	10		23	5		
14		CL	Lean CLAY - stiff, wet to moist, grey						32	14
		SM	Layered Silty SAND - SILT with sand - silt - Clayey SILT							
15	50			3 3 7 8	10					
16			Bottom of Boring @ 51.5 Feet							
	55									
17										
18										

SPT BLOW COUNT 10 20 30 40 50 60 70 80 90

Moisture Content and Atterberg Limits
Plastic Limit Moisture Content Liquid Limit
10 20 30 40 50 60 70 80 90

N - OBSERVED UNCORRECTED BLOW COUNT * N - UNCORRECTED, EQUIVALENT SPT BLOW COUNT FR - FIELD REFUSAL

IGES®

SAMPLE TYPE
☒ - 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- 3" O.D./2.38" I.D. CALIFORNIA SAMPLER
- 2.5" O.D./1.88" I.D. MOD. CAL. SAMPLER

NOTES:
Water added, unable to measure groundwater depth

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
A - 9b

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			USCS SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
			SC	CLAYEY SANDS SAND-GRAVEL-CLAY MIXTURES
FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid limit less than 50)		ML	INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid limit greater than 50)		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

LOG KEY SYMBOLS

BORING SAMPLE LOCATION

TEST-PIT SAMPLE LOCATION

WATER LEVEL (level after completion)

WATER LEVEL (level where first encountered)

CEMENTATION

DESCRIPTION	DESCRIPTION
WEAKLY	CRUMBLES OR BREAKS WITH HANDLING OR SLIGHT FINGER PRESSURE
MODERATELY	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE
STRONGLY	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE

OTHER TESTS KEY

C	CONSOLIDATION	SA	SIEVE ANALYSIS
AL	ATTERBURG LIMITS	DS	DIRECT SHEAR
UC	UNCONFINED COMPRESSION	T	TRIAXIAL
S	SOLUBILITY	R	RESISTIVITY
O	ORGANIC CONTENT	RV	R-VALUE
CBR	CALIFORNIA BEARING RATIO	SU	SOLUBLE SULFATES
COMP	MOISTURE/DENSITY RELATIONSHIP	PM	PERMEABILITY
CI	CALIFORNIA IMPACT	-200	% FINER THAN #200
COL	COLLAPSE POTENTIAL	Gs	SPECIFIC GRAVITY
SS	SHRINK SWELL	SL	SWELL LOAD

MODIFIERS

DESCRIPTION	%
TRACE	<5
SOME	5 - 12
WITH	>12

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL BELOW WATER TABLE

STRATIFICATION

DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2"
LAYER	1/2 - 12"

DESCRIPTION	THICKNESS
OCCASIONAL	ONE OR LESS PER FOOT OF THICKNESS
FREQUENT	MORE THAN ONE PER FOOT OF THICKNESS

GENERAL NOTES

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil conditions between individual sample locations.
3. Logs represent general soil conditions observed at the point of exploration on the date indicated.
4. In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT (blows/ft)	MODIFIED CA. SAMPLER (blows/ft)	CALIFORNIA SAMPLER (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
VERY LOOSE	<4	<4	<5	0 - 15	EASILY PENETRATED WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
LOOSE	4 - 10	5 - 12	5 - 15	15 - 35	DIFFICULT TO PENETRATE WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
MEDIUM DENSE	10 - 30	12 - 35	15 - 40	35 - 65	EASILY PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
DENSE	30 - 50	35 - 60	40 - 70	65 - 85	DIFFICULT TO PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
VERY DENSE	>50	>60	>70	85 - 100	PENETRATED ONLY A FEW INCHES WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER

CONSISTENCY - FINE-GRAINED SOIL

		TORVANE	POCKET PENETROMETER	FIELD TEST
CONSISTENCY	SPT (blows/ft)	UNTRAINED SHEAR STRENGTH (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	
VERY SOFT	<2	<0.125	<0.25	EASILY PENETRATED SEVERAL INCHES BY THUMB. EXUDES BETWEEN THUMB AND FINGERS WHEN SQUEEZED BY HAND.
SOFT	2 - 4	0.125 - 0.25	0.25 - 0.5	EASILY PENETRATED ONE INCH BY THUMB. MOLDED BY LIGHT FINGER PRESSURE.
MEDIUM STIFF	4 - 8	0.25 - 0.5	0.5 - 1.0	PENETRATED OVER 1/2 INCH BY THUMB WITH MODERATE EFFORT. MOLDED BY STRONG FINGER PRESSURE.
STIFF	8 - 15	0.5 - 1.0	1.0 - 2.0	INDENTED ABOUT 1/2 INCH BY THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.
VERY STIFF	15 - 30	1.0 - 2.0	2.0 - 4.0	READILY INDENTED BY THUMBNAIL.
HARD	>30	>2.0	>4.0	INDENTED WITH DIFFICULTY BY THUMBNAIL.

IGES

Project Number 00823-012

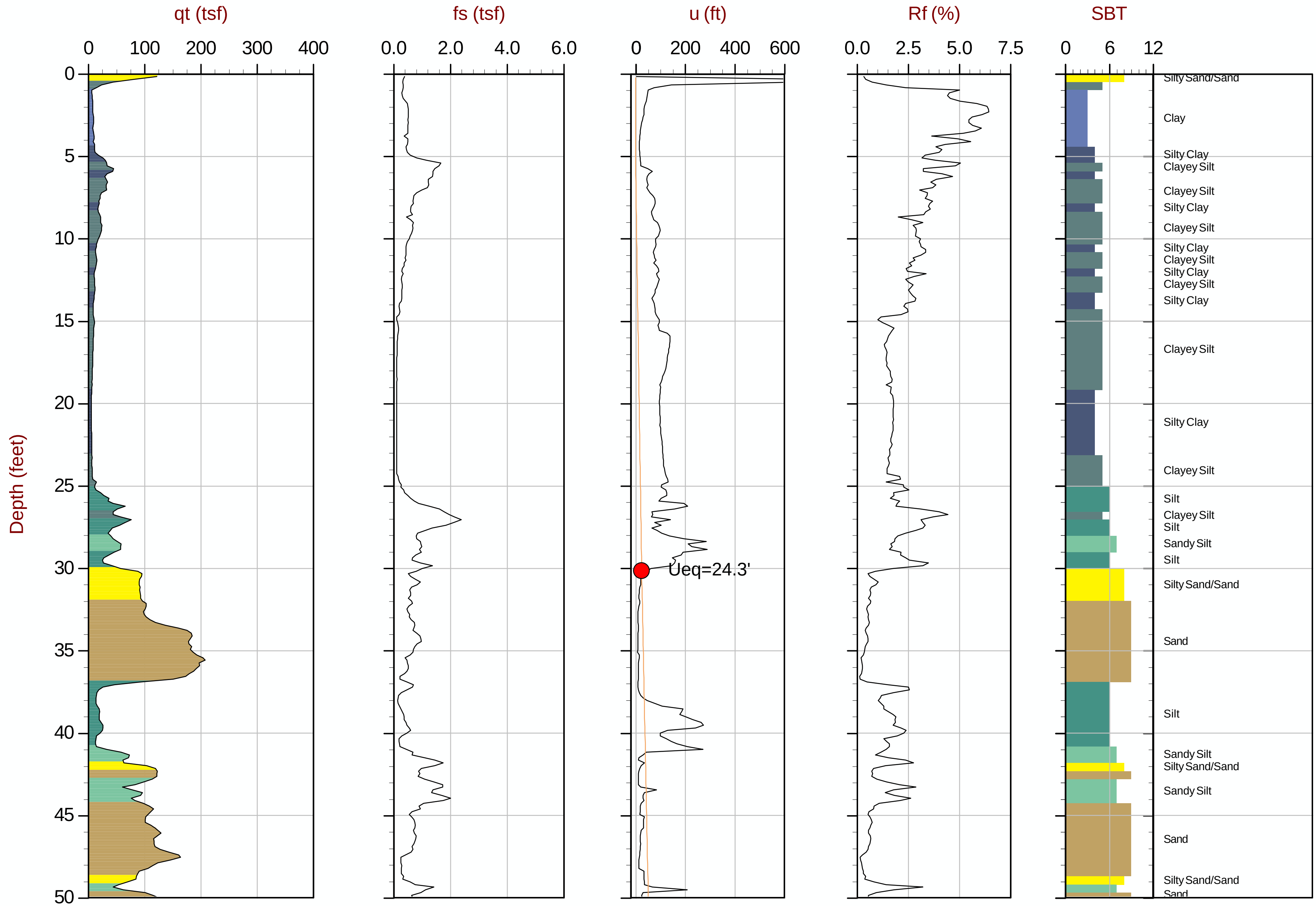
Plate A-10

ConeTec

IGES

Job No: 13-52004
Date: 01:25:13 09:47
Site: Logan Water Treatment Plant

Sounding: CPT-01
Cone: 155:T1500F15U500



Max Depth: 32.050 m / 105.15 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.150 m

File: 13-52004_SP01.COR
Unit Wt: SBT Chart Soil Zones

SBT: Lunne, Robertson and Powell, 1997
Coords: Lat: 41.739583 Long: -111.896717
Equilibrium Pore Pressure from Dissipation

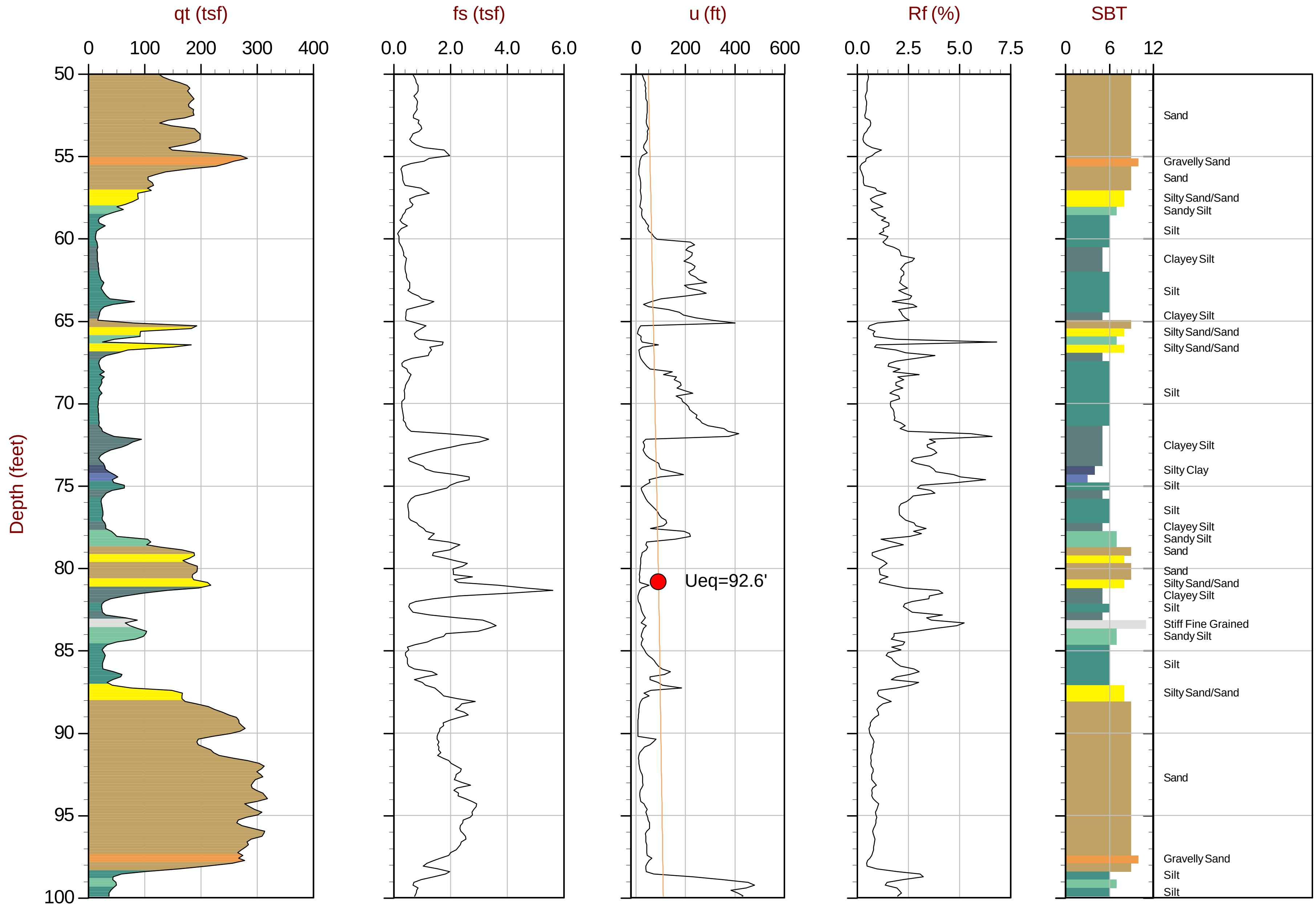
Plate A-11a

CONETEC

IGES

Job No: 13-52004
Date: 01:25:13 09:47
Site: Logan Water Treatment Plant

Sounding: CPT-01
Cone: 155:T1500F15U500



Max Depth: 32.050 m / 105.15 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.150 m

File: 13-52004_SP01.COR
Unit Wt: SBT Chart Soil Zones

SBT: Lunne, Robertson and Powell, 1997
Coords: Lat: 41.739583 Long: -111.896717
Equilibrium Pore Pressure from Dissipation

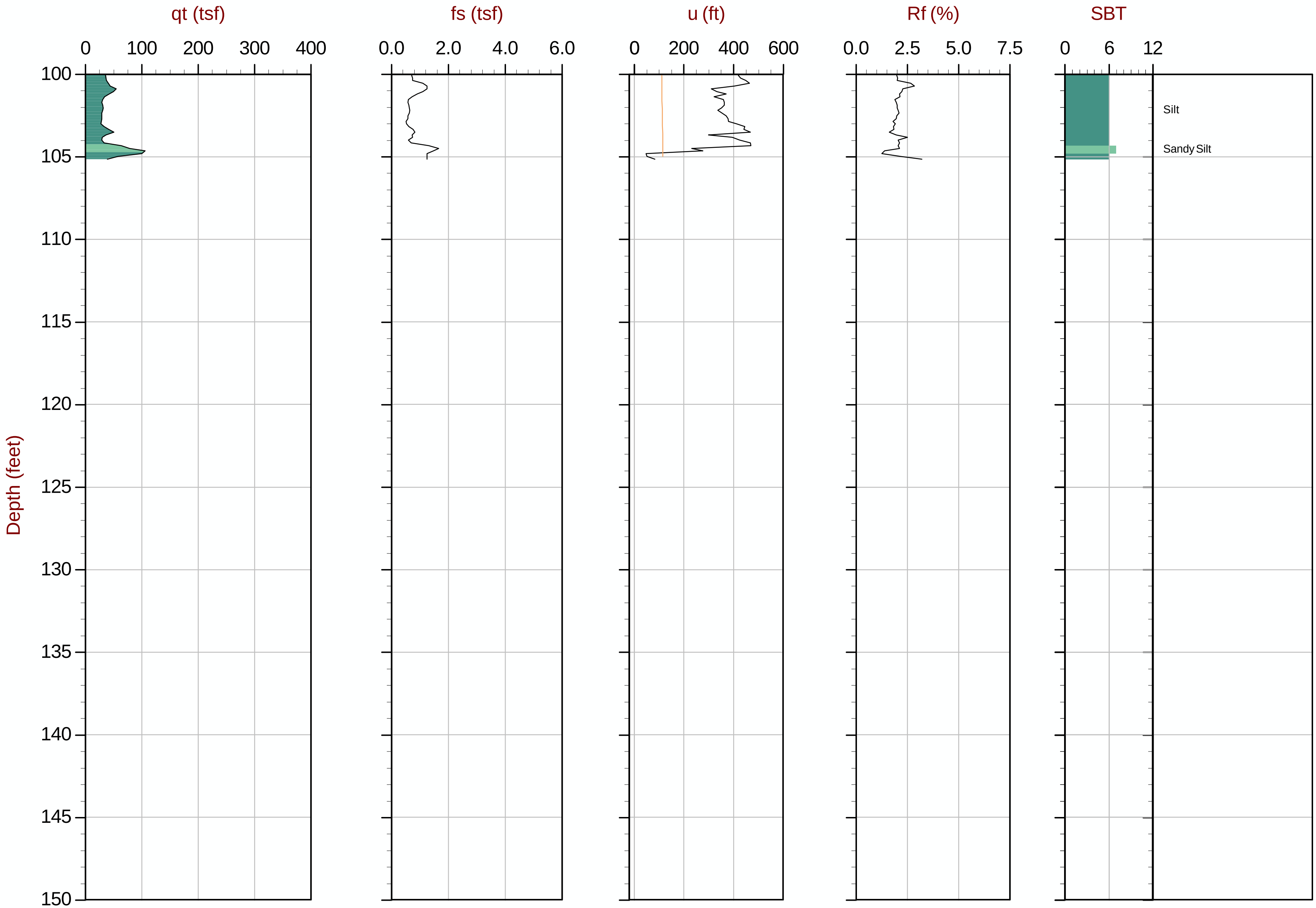
Plate
A-11b

CONETEC

IGES

Job No: 13-52004
Date: 01:25:13 09:47
Site: Logan Water Treatment Plant

Sounding: CPT-01
Cone: 155:T1500F15U500



Max Depth: 32.050 m / 105.15 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.150 m

File: 13-52004_SP01.COR
Unit Wt: SBT Chart Soil Zones

SBT: Lunne, Robertson and Powell, 1997
Coords: Lat: 41.739583 Long: -111.896717
Equilibrium Pore Pressure from Dissipation

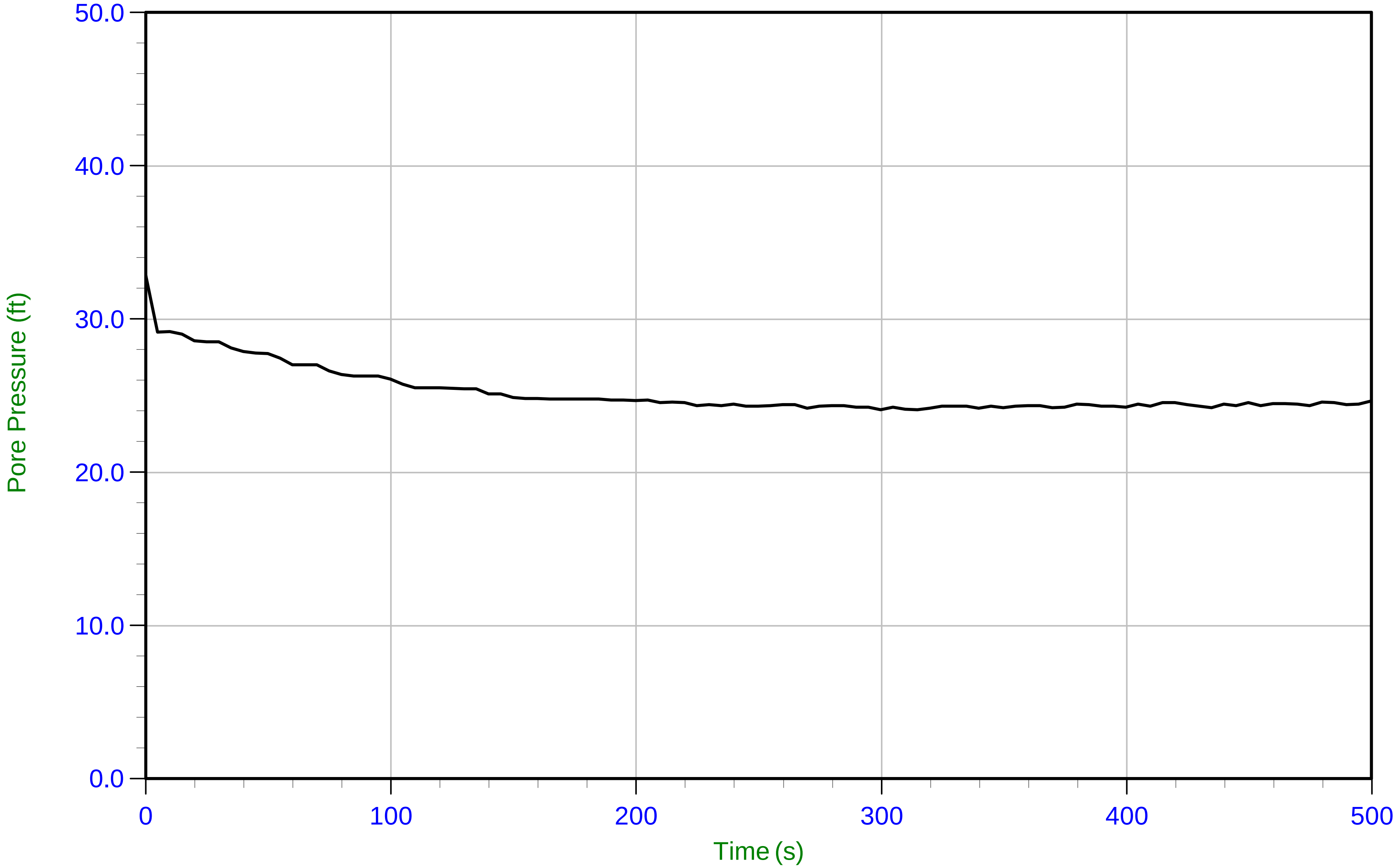
Plate
A-11c

CONETEC

IGES

Job No: 13-52004
Date: 25-Jan-2013 09:47:14
Site: Logan Water Treatment Plant

Sounding: CPT-01
Cone: 155
Cone Area: 15 sq cm



Trace Summary:

Filename: 13-52004_SP01.PPD
Depth: 9.200 m / 30.183 ft
Duration: 500.0 s

U Min: 24.1 ft
U Max: 32.9 ft

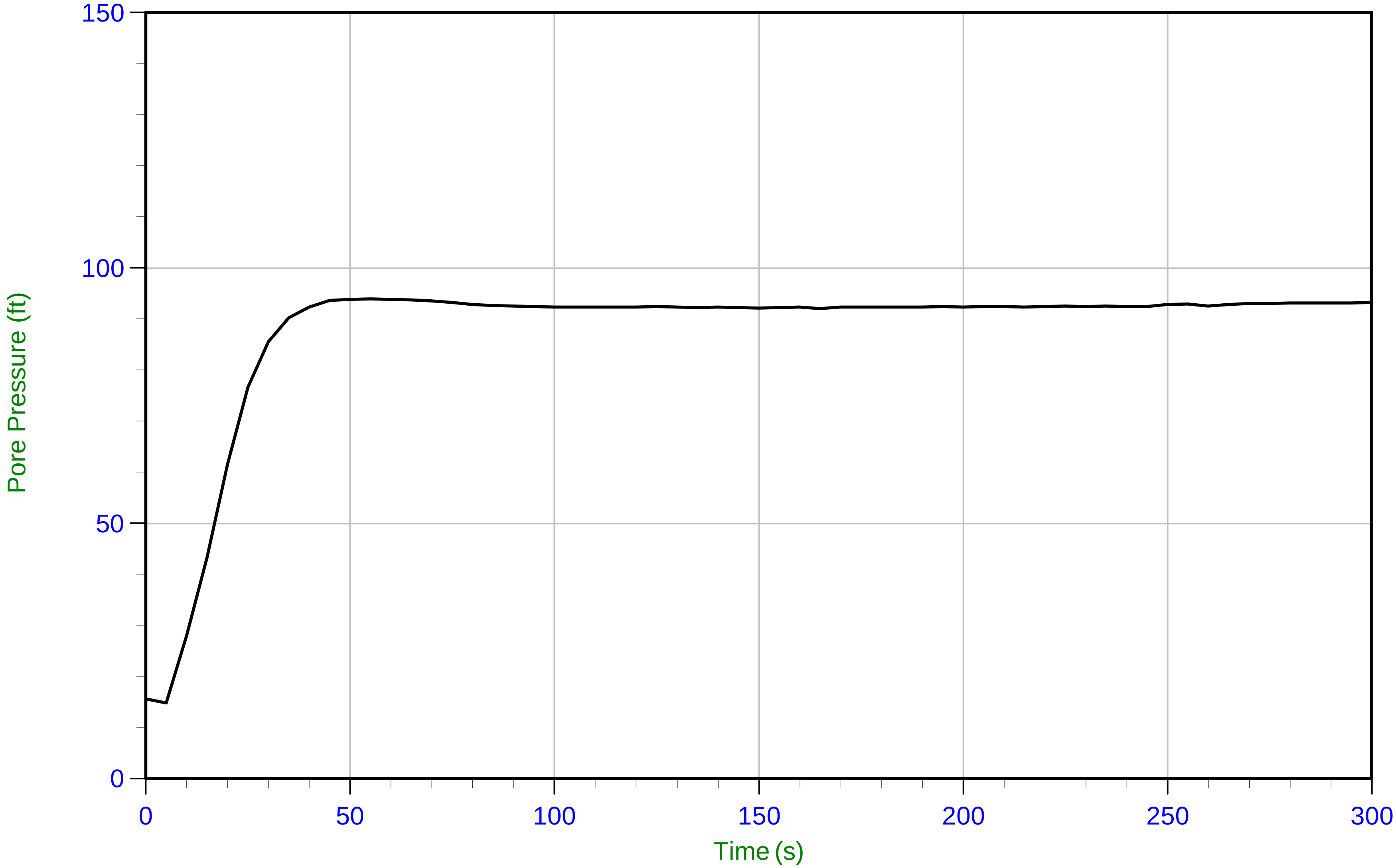
WT: 1.790 m / 5.873 ft
Ueq: 24.3 ft

Plate A-12a

IGES

Job No: 13-52004
Date: 25-Jan-2013 09:47:14
Site: Logan Water Treatment Plant

Sounding: CPT-01
Cone: 155
Cone Area: 15 sq cm



Trace Summary:

Filename: 13-52004_SP01.PPD
Depth: 24.650 m / 80.872 ft
Duration: 300.0 s

U Min: 14.8 ft
U Max: 93.9 ft

WT: -3.570 m / -11.712 ft
Ueq: 92.6 ft

Plate A-12b

CONETEC

IGES

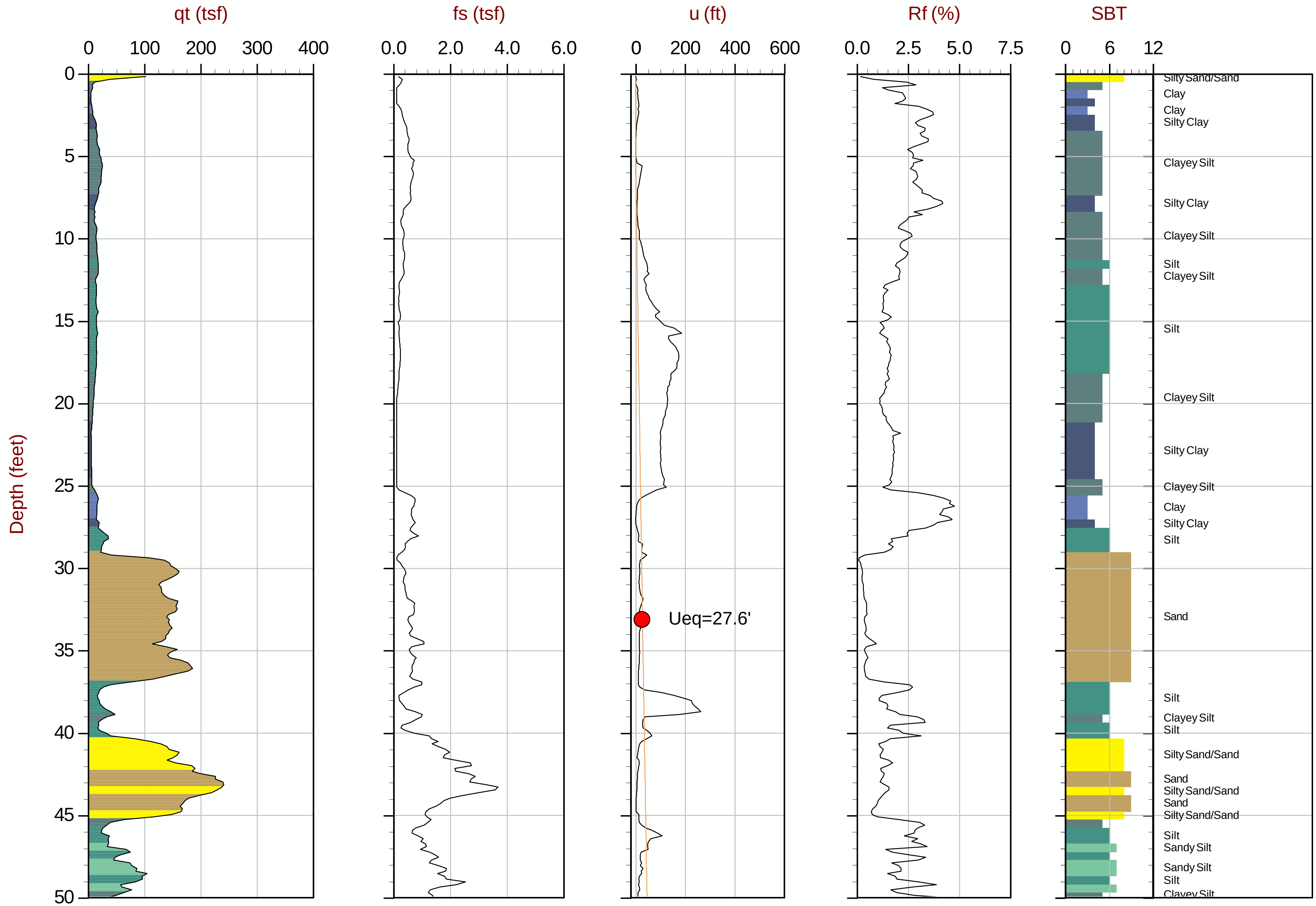
Job No: 13-52004

Date: 01:25:13 11:41

Site: Logan Water Treatment Plant

Sounding: CPT-02

Cone: 155:T1500F15U500



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.150 m

File: 13-52004_CP02.COR
Unit Wt: SBT Chart Soil Zones

SBT: Lunne, Robertson and Powell, 1997
Coords: Lat: 41.739150 Long: -111.894583
Equilibrium Pore Pressure from Dissipation

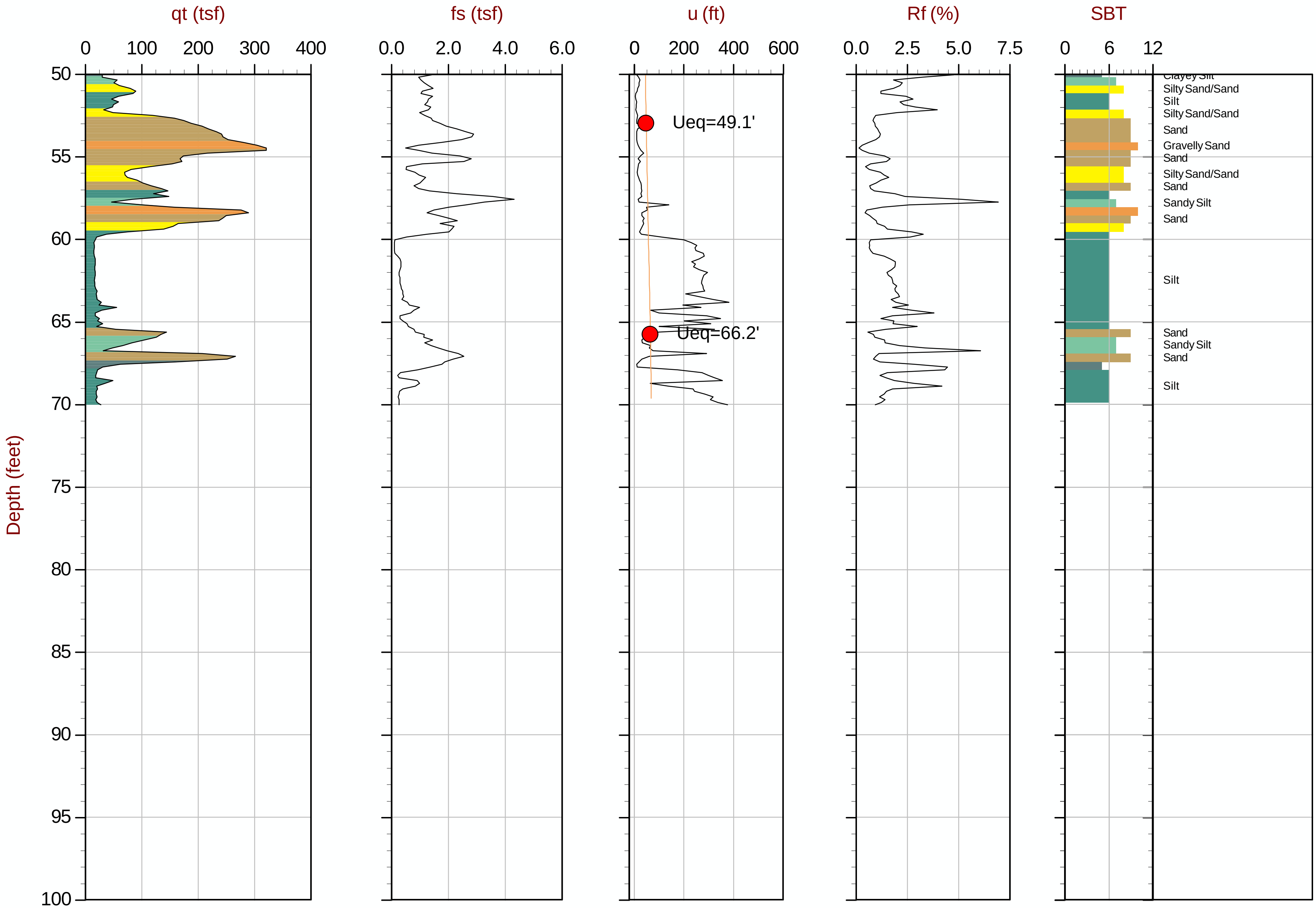
Plate
A-13a

CONETEC

IGES

Job No: 13-52004
Date: 01:25:13 11:41
Site: Logan Water Treatment Plant

Sounding: CPT-02
Cone: 155:T1500F15U500



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.150 m

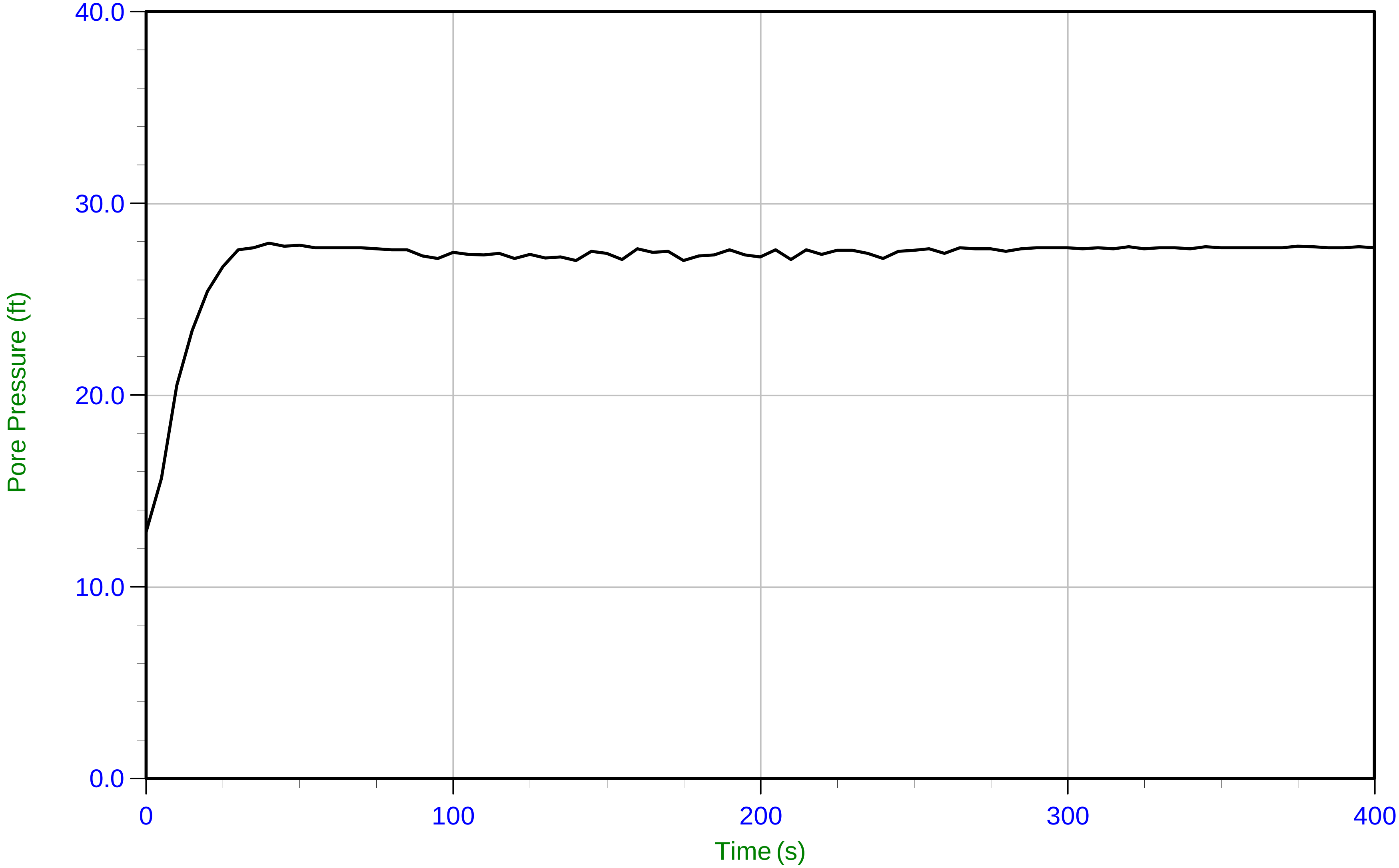
File: 13-52004_CP02.COR
Unit Wt: SBT Chart Soil Zones

SBT: Lunne, Robertson and Powell, 1997
Coords: Lat: 41.739150 Long: -111.894583
Equilibrium Pore Pressure from Dissipation

Plate
A-13b

ConeTec

IGES	Job No: 13-52004	Sounding: CPT-02
	Date: 25-Jan-2013 11:41:04	Cone: 155
	Site: Logan Water Treatment Plant	Cone Area: 15 sq cm



Trace Summary:

Filename: 13-52004_CP02.PPD	U Min: 12.9 ft	WT: 1.692 m / 5.551 ft
Depth: 10.100 m / 33.136 ft	U Max: 27.9 ft	Ueq: 27.6 ft
Duration: 400.0 s		

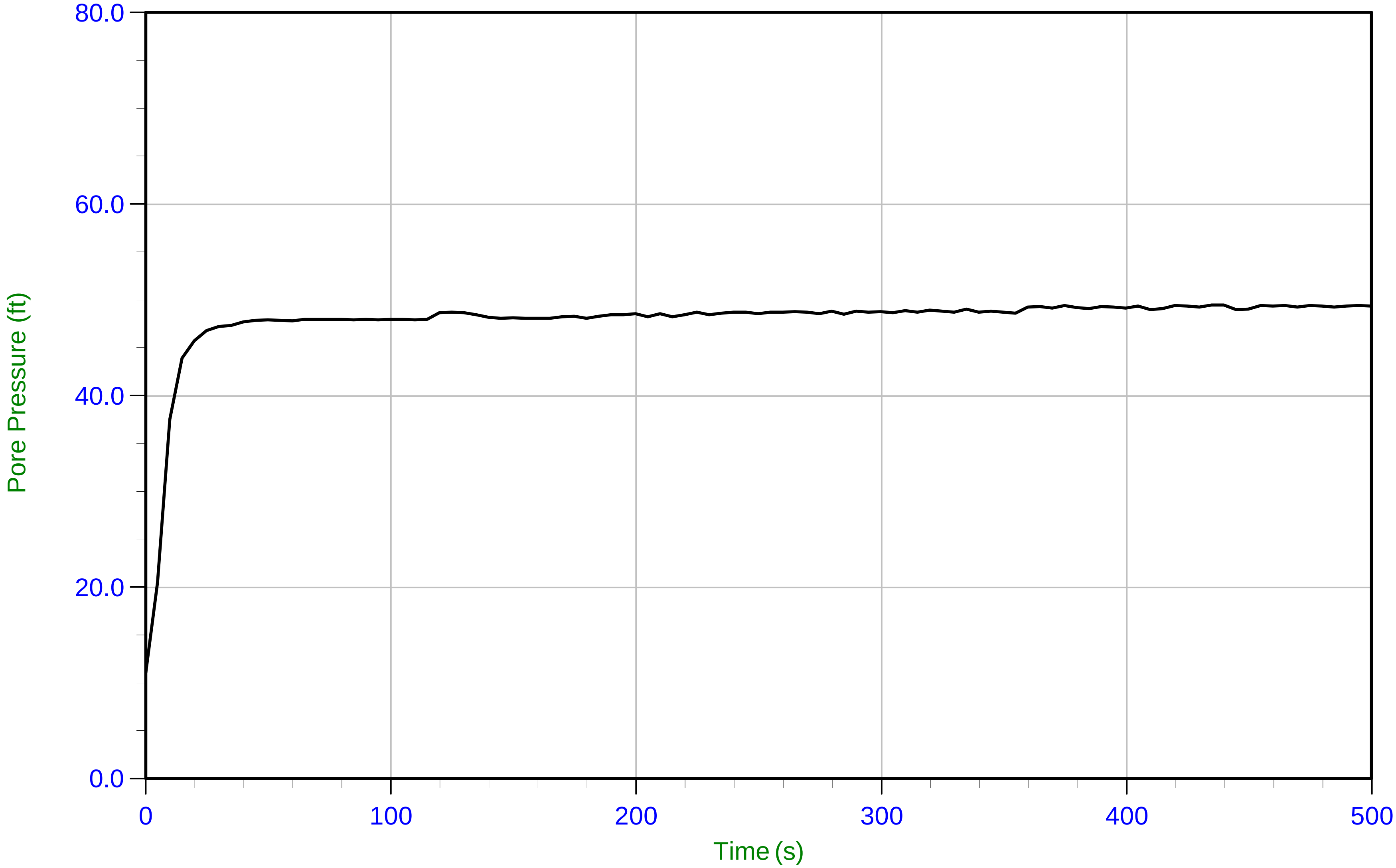
Plate A-14a

CONETEC

IGES

Job No: 13-52004
Date: 25-Jan-2013 11:41:04
Site: Logan Water Treatment Plant

Sounding: CPT-02
Cone: 155
Cone Area: 15 sq cm



Trace Summary:

Filename: 13-52004_CP02.PPD
Depth: 16.150 m / 52.985 ft
Duration: 500.0 s

U Min: 11.1 ft
U Max: 49.5 ft

WT: 1.183 m / 3.881 ft
Ueq: 49.1 ft

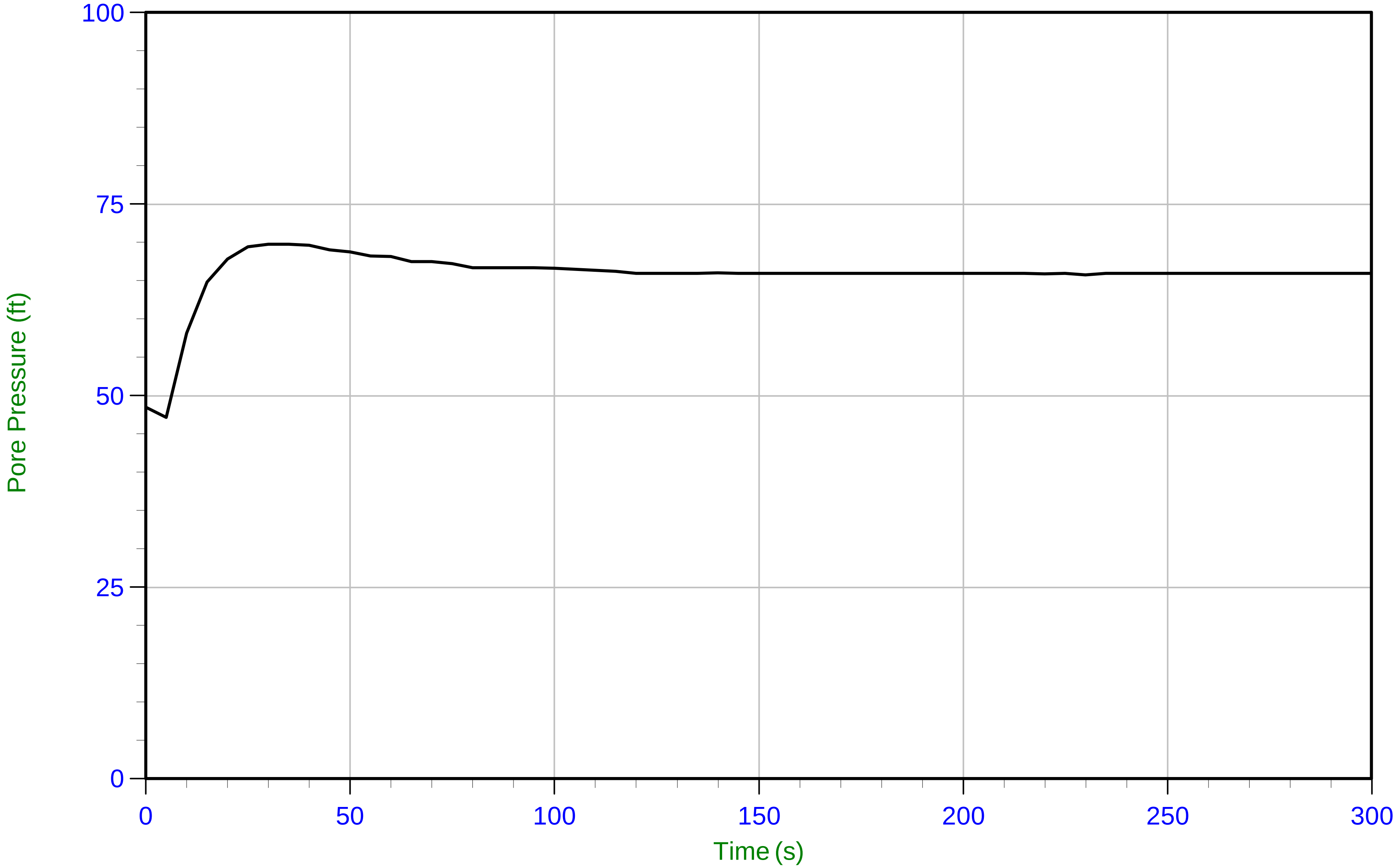
Plate A-14b

CONETEC

IGES

Job No: 13-52004
Date: 25-Jan-2013 11:41:04
Site: Logan Water Treatment Plant

Sounding: CPT-02
Cone: 155
Cone Area: 15 sq cm



Trace Summary:

Filename: 13-52004_CP02.PPD
Depth: 20.050 m / 65.780 ft
Duration: 300.0 s

U Min: 47.2 ft
U Max: 69.7 ft

WT: -0.130 m / -0.427 ft
Ueq: 66.2 ft

Plate A-14c

APPENDIX B

Water Content and Unit Weight of Soil

(In General Accordance with ASTM D7263 Method B and D2216)

IGES

Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah
Date: 2/21/2013
By: BRR

Sample Info.	Boring No.	B-01	B-01	B-02	B-05	B-07	B-07	B-07	B-08
	Sample:					6A			
	Depth:	5'	34.5'	54.5'	5'	29.5'	34.5'	49.5'	29.5'
Unit Weight Info.	Sample height, H (in)	3.000	3.000					4.000	
	Sample diameter, D (in)	2.416	2.416					2.416	
	Sample volume, V (ft^3)	0.0080	0.0080					0.0106	
	Mass rings + wet soil (g)	537.97	1544.14					753.04	
	Mass rings/tare (g)	131.40	1089.84					178.02	
	Moist soil, Ws (g)	406.57	454.30					575.02	
	Moist unit wt., γ_m (pcf)	112.62	125.84					119.46	
Water Content	Wet soil + tare (g)	528.83	442.62	517.42	380.57	340.32	540.47	700.30	428.16
	Dry soil + tare (g)	418.83	385.63	436.35	324.13	294.59	447.85	563.49	345.94
	Tare (g)	123.53	151.47	121.43	122.42	126.76	128.36	127.42	129.44
Water Content, w (%)		**37.3**	**24.3**	**25.7**	**28.0**	**27.2**	**29.0**	**31.4**	**38.0**
Dry Unit Wt., γ_d (pcf)		**82.1**	**101.2**					**90.9**	

Entered by:___________

Reviewed:___________

Water Content and Unit Weight of Soil

(In General Accordance with ASTM D7263 Method B and D2216)

Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah
Date: 2/21/2013
By: BRR

Sample Info.	Boring No.	B-11	B-11	B-12					
	Sample:			B					
	Depth:	24.5'	44.5'	44.5'					
Unit Weight Info.	Sample height, H (in)		4.000						
	Sample diameter, D (in)		2.416						
	Sample volume, V (ft^3)		0.0106						
	Mass rings + wet soil (g)		792.60						
	Mass rings/tare (g)		174.88						
	Moist soil, Ws (g)		617.72						
	Moist unit wt., γ_m (pcf)		128.33						
Water Content	Wet soil + tare (g)	410.22	735.04	335.37					
	Dry soil + tare (g)	330.06	618.53	296.91					
	Tare (g)	122.79	120.97	126.98					
Water Content, w (%)		**38.7**	**23.4**	**22.6**					
Dry Unit Wt., γ_d (pcf)			**104.0**						

Entered by:___________

Reviewed:___________

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/15/2013
By: DKS

Boring No.: B-02
Sample:
Depth: 24.5'
Description: Grey fat clay

Preparation method: Wet
Liquid limit test method: Multipoint

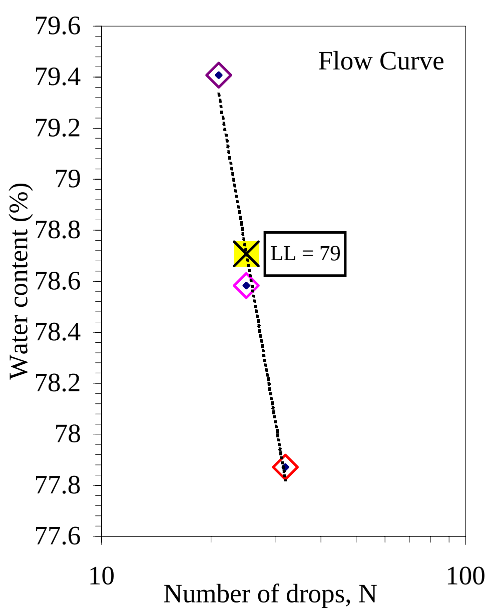
Plastic Limit

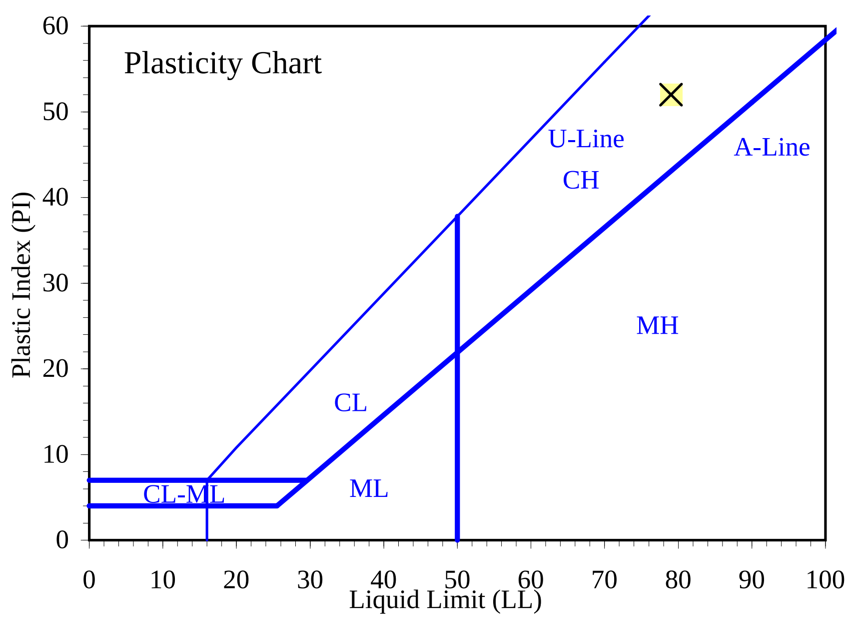
Determination No	1	2			
Wet Soil + Tare (g)	33.42	33.67			
Dry Soil + Tare (g)	30.84	31.10			
Moisture Loss (g)	2.58	2.57			
Tare (g)	21.47	21.67			
Dry Soil (g)	9.37	9.43			
Water Content, w (%)	27.53	27.25			

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	32	25	21			
Wet Soil + Tare (g)	32.29	33.05	33.80			
Dry Soil + Tare (g)	27.68	28.06	28.44			
Moisture Loss (g)	4.61	4.99	5.36			
Tare (g)	21.76	21.71	21.69			
Dry Soil (g)	5.92	6.35	6.75			
Water Content, w (%)	77.87	78.58	79.41			
One-Point LL (%)		79	78			

Liquid Limit, LL (%)	**79**
Plastic Limit, PL (%)	**27**
Plasticity Index, PI (%)	**52**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/28/2013
By: BRR

Boring No.: B-02
Sample:
Depth: 39.5'
Description: Grey lean clay

Preparation method: Air Dry
Liquid limit test method: Multipoint

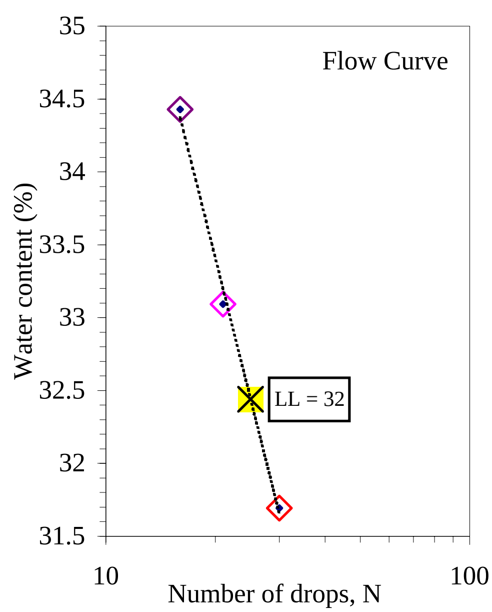
Plastic Limit

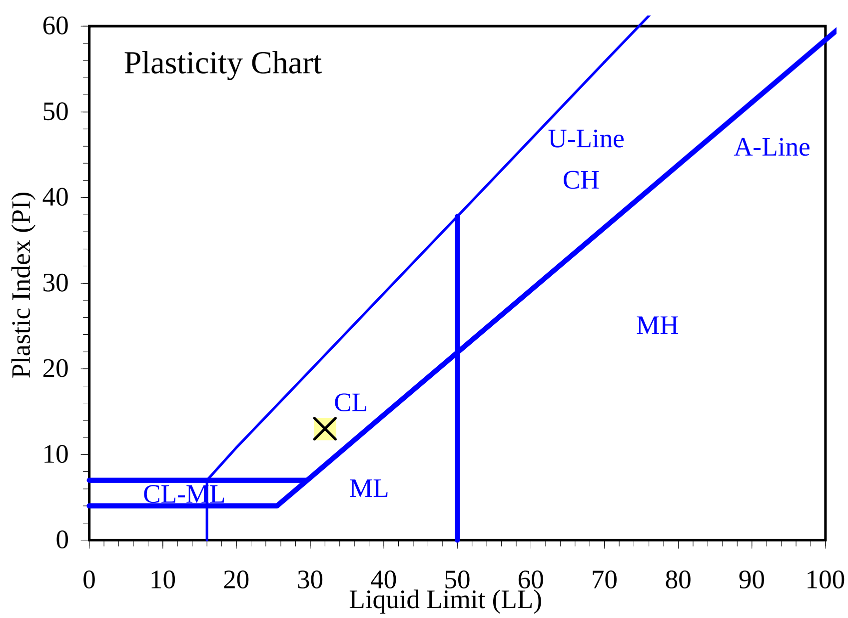
Determination No	1	2				
Wet Soil + Tare (g)	32.45	32.61				
Dry Soil + Tare (g)	30.68	30.88				
Moisture Loss (g)	1.77	1.73				
Tare (g)	21.50	21.68				
Dry Soil (g)	9.18	9.20				
Water Content, w (%)	19.28	18.80				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	30	21	16			
Wet Soil + Tare (g)	31.13	32.88	30.29			
Dry Soil + Tare (g)	28.81	30.12	28.09			
Moisture Loss (g)	2.32	2.76	2.20			
Tare (g)	21.49	21.78	21.70			
Dry Soil (g)	7.32	8.34	6.39			
Water Content, w (%)	31.69	33.09	34.43			
One-Point LL (%)	32	32				

Liquid Limit, LL (%)	**32**
Plastic Limit, PL (%)	**19**
Plasticity Index, PI (%)	**13**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

IGES

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/15/2013
By: DKS

Boring No.: B-02
Sample:
Depth: 54.5'
Description: Grey silt

Preparation method: Wet
Liquid limit test method: Multipoint

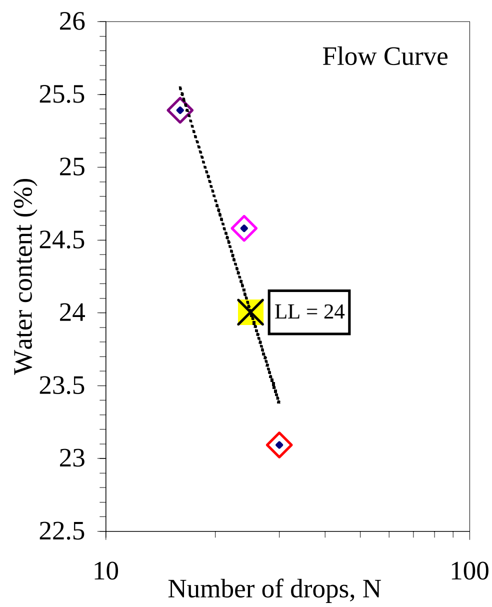
Plastic Limit

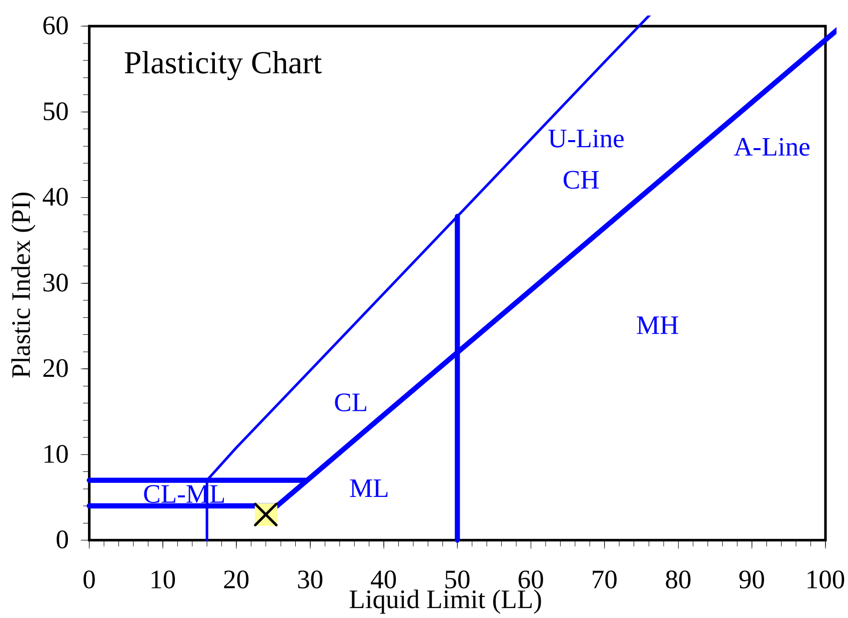
Determination No	1	2			
Wet Soil + Tare (g)	36.33	38.63			
Dry Soil + Tare (g)	33.85	35.72			
Moisture Loss (g)	2.48	2.91			
Tare (g)	21.81	21.68			
Dry Soil (g)	12.04	14.04			
Water Content, w (%)	20.60	20.73			

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	30	24	16			
Wet Soil + Tare (g)	33.26	33.22	34.35			
Dry Soil + Tare (g)	31.14	31.02	31.75			
Moisture Loss (g)	2.12	2.20	2.60			
Tare (g)	21.96	22.07	21.51			
Dry Soil (g)	9.18	8.95	10.24			
Water Content, w (%)	23.09	24.58	25.39			
One-Point LL (%)	24	24				

Liquid Limit, LL (%)	**24**
Plastic Limit, PL (%)	**21**
Plasticity Index, PI (%)	**3**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

IGES

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/15/2013
By: DKS

Boring No.: B-05
Sample:
Depth: 5.0'
Description: Brown fat clay

Preparation method: Wet
Liquid limit test method: Multipoint

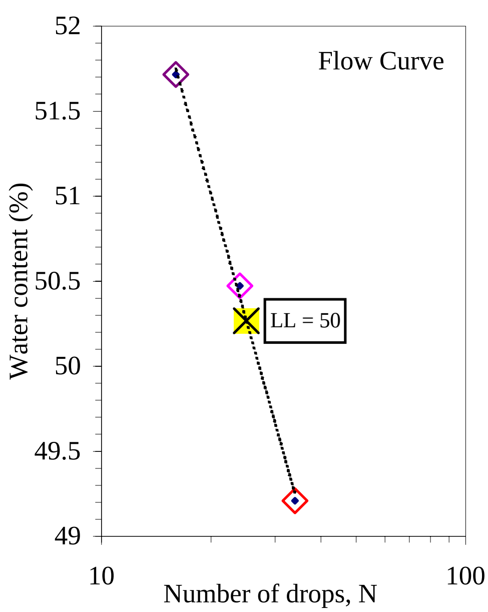
Plastic Limit

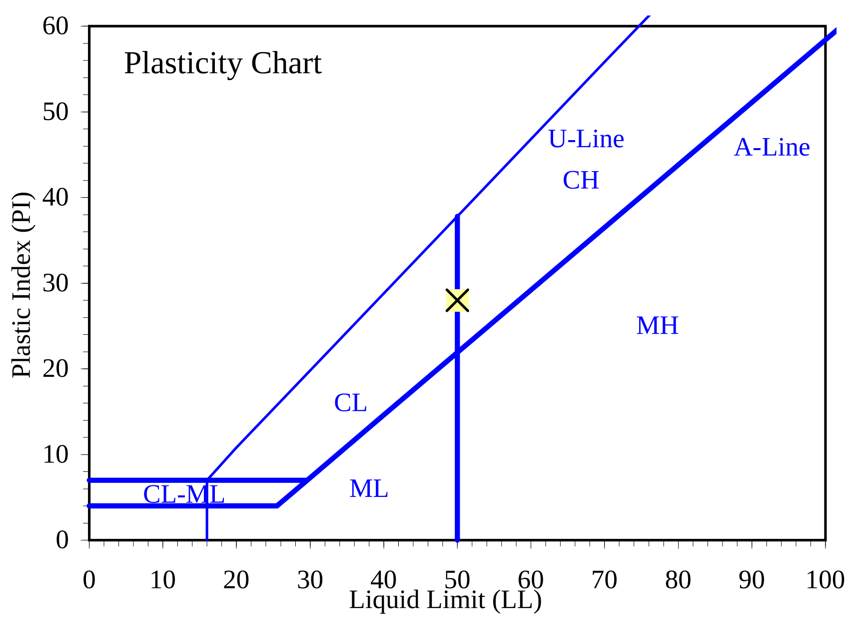
Determination No	1	2			
Wet Soil + Tare (g)	35.08	36.92			
Dry Soil + Tare (g)	32.69	34.24			
Moisture Loss (g)	2.39	2.68			
Tare (g)	21.85	21.66			
Dry Soil (g)	10.84	12.58			
Water Content, w (%)	22.05	21.30			

Liquid Limit

Determination No	1	2	3		
Number of Drops, N	34	24	16		
Wet Soil + Tare (g)	32.12	34.30	33.87		
Dry Soil + Tare (g)	28.70	30.03	29.80		
Moisture Loss (g)	3.42	4.27	4.07		
Tare (g)	21.75	21.57	21.93		
Dry Soil (g)	6.95	8.46	7.87		
Water Content, w (%)	49.21	50.47	51.72		
One-Point LL (%)		50			

Liquid Limit, LL (%)	**50**
Plastic Limit, PL (%)	**22**
Plasticity Index, PI (%)	**28**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/18/2013
By: DKS

Boring No.: B-05
Sample:
Depth: 19.5'
Description: Grey fat clay

Preparation method: Wet
Liquid limit test method: Multipoint

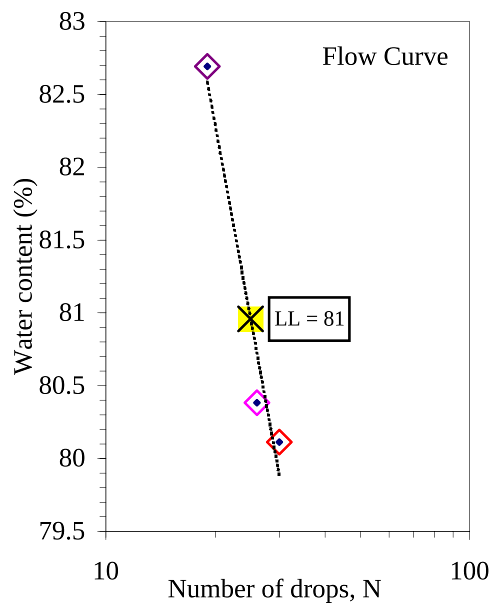
Plastic Limit

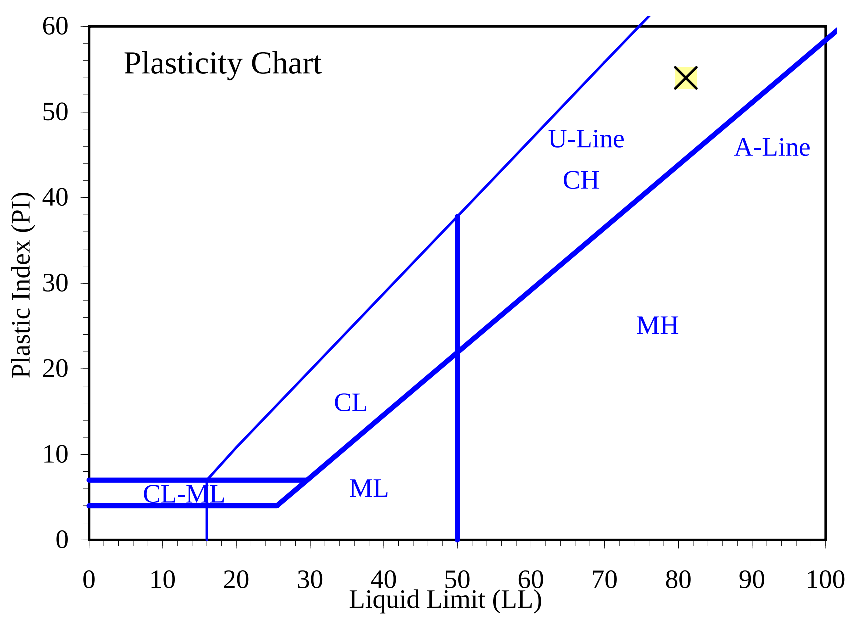
Determination No	1	2			
Wet Soil + Tare (g)	32.98	33.29			
Dry Soil + Tare (g)	30.50	30.81			
Moisture Loss (g)	2.48	2.48			
Tare (g)	21.44	21.55			
Dry Soil (g)	9.06	9.26			
Water Content, w (%)	27.37	26.78			

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	30	26	19			
Wet Soil + Tare (g)	31.48	32.53	32.35			
Dry Soil + Tare (g)	27.21	27.49	27.62			
Moisture Loss (g)	4.27	5.04	4.73			
Tare (g)	21.88	21.22	21.90			
Dry Soil (g)	5.33	6.27	5.72			
Water Content, w (%)	80.11	80.38	82.69			
One-Point LL (%)	82	81				

Liquid Limit, LL (%)	**81**
Plastic Limit, PL (%)	**27**
Plasticity Index, PI (%)	**54**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

IGES

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/18/2013
By: DKS

Boring No.: B-05
Sample:
Depth: 24.5'
Description: Light grey lean clay

Preparation method: Wet
Liquid limit test method: Multipoint

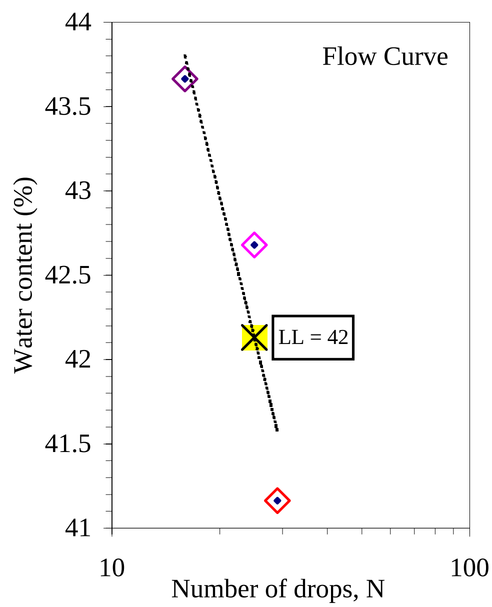
Plastic Limit

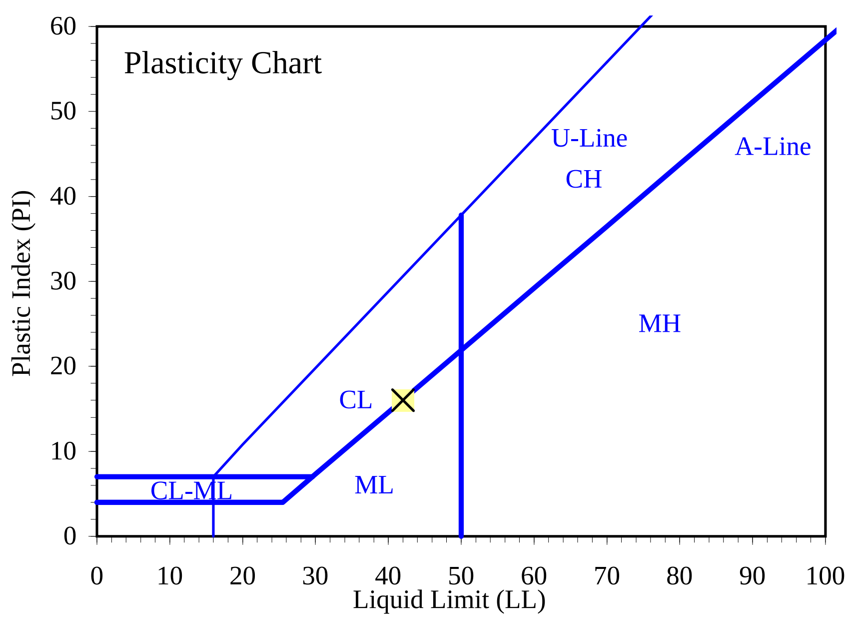
Determination No	1	2				
Wet Soil + Tare (g)	35.00	37.19				
Dry Soil + Tare (g)	32.32	34.04				
Moisture Loss (g)	2.68	3.15				
Tare (g)	21.93	21.86				
Dry Soil (g)	10.39	12.18				
Water Content, w (%)	25.79	25.86				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	29	25	16			
Wet Soil + Tare (g)	34.24	34.37	35.20			
Dry Soil + Tare (g)	30.56	30.58	31.10			
Moisture Loss (g)	3.68	3.79	4.10			
Tare (g)	21.62	21.70	21.71			
Dry Soil (g)	8.94	8.88	9.39			
Water Content, w (%)	41.16	42.68	43.66			
One-Point LL (%)	42	43				

Liquid Limit, LL (%)	**42**
Plastic Limit, PL (%)	**26**
Plasticity Index, PI (%)	**16**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/19/2013
By: DKS

Boring No.: B-05
Sample:
Depth: 59.5'
Description: Grey silt

Preparation method: Wet
Liquid limit test method: Multipoint

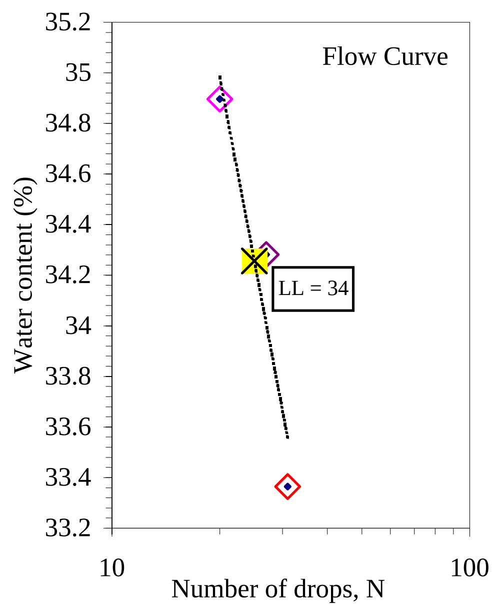
Plastic Limit

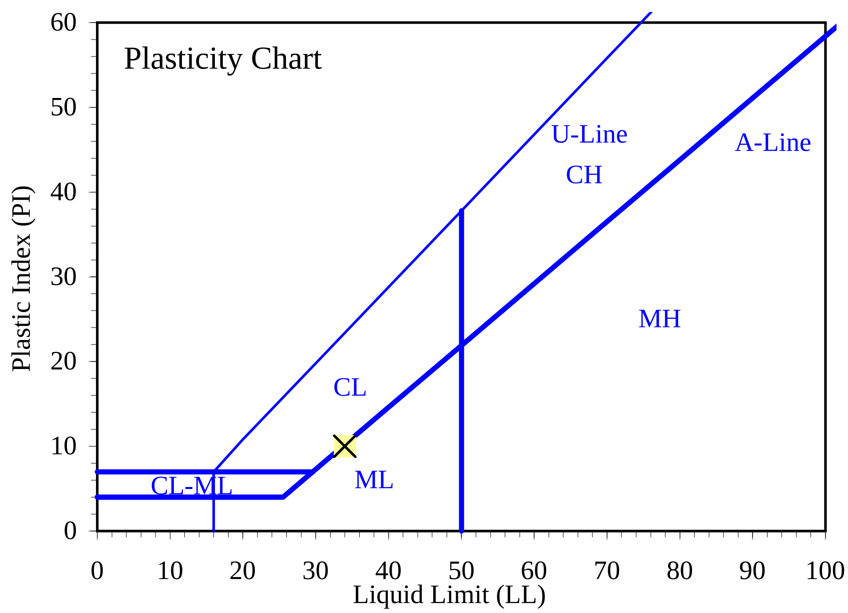
Determination No	1	2			
Wet Soil + Tare (g)	33.27	39.24			
Dry Soil + Tare (g)	31.03	35.81			
Moisture Loss (g)	2.24	3.43			
Tare (g)	21.80	21.67			
Dry Soil (g)	9.23	14.14			
Water Content, w (%)	24.27	24.26			

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	31	20	27			
Wet Soil + Tare (g)	35.96	33.04	31.28			
Dry Soil + Tare (g)	32.36	29.99	28.87			
Moisture Loss (g)	3.60	3.05	2.41			
Tare (g)	21.57	21.25	21.84			
Dry Soil (g)	10.79	8.74	7.03			
Water Content, w (%)	33.36	34.90	34.28			
One-Point LL (%)		34	35			

Liquid Limit, LL (%)	**34**
Plastic Limit, PL (%)	**24**
Plasticity Index, PI (%)	**10**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

IGES

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/25/2013
By: DKS

Boring No.: B-05
Sample:
Depth: 69.5'
Description: Grey fat clay

Preparation method: Wet
Liquid limit test method: Multipoint

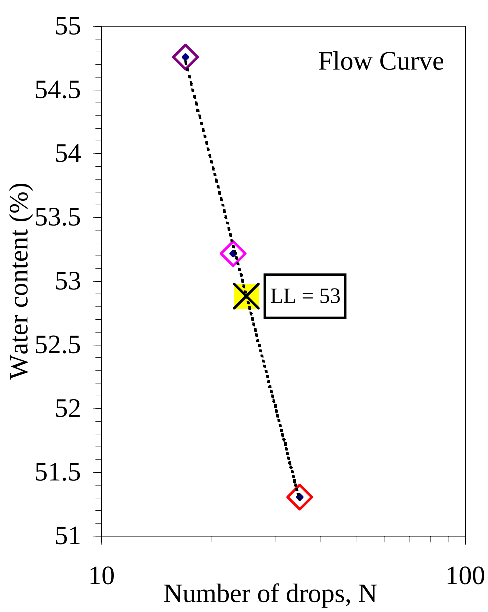
Plastic Limit

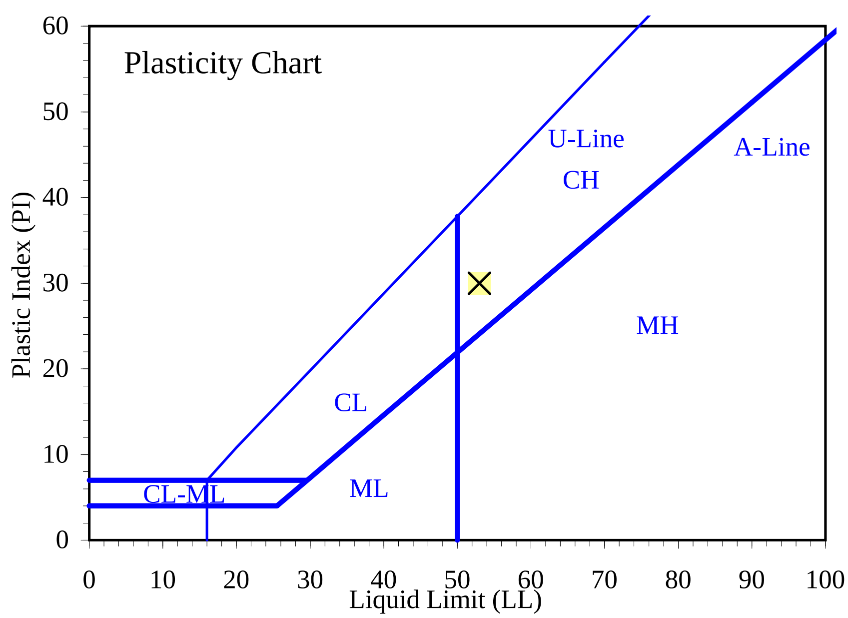
Determination No	1	2			
Wet Soil + Tare (g)	38.21	37.44			
Dry Soil + Tare (g)	35.12	34.49			
Moisture Loss (g)	3.09	2.95			
Tare (g)	21.68	21.67			
Dry Soil (g)	13.44	12.82			
Water Content, w (%)	22.99	23.01			

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	35	23	17			
Wet Soil + Tare (g)	32.71	34.57	33.48			
Dry Soil + Tare (g)	28.98	30.02	29.28			
Moisture Loss (g)	3.73	4.55	4.20			
Tare (g)	21.71	21.47	21.61			
Dry Soil (g)	7.27	8.55	7.67			
Water Content, w (%)	51.31	53.22	54.76			
One-Point LL (%)		53				

Liquid Limit, LL (%)	**53**
Plastic Limit, PL (%)	**23**
Plasticity Index, PI (%)	**30**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/25/2013
By: DKS

Boring No.: B-7
Sample:
Depth: 9.5'
Description: Brown fat clay

Preparation method: Wet
Liquid limit test method: Multipoint

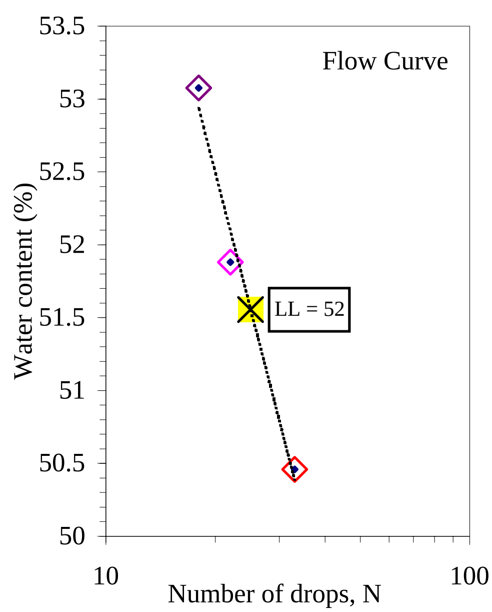
Plastic Limit

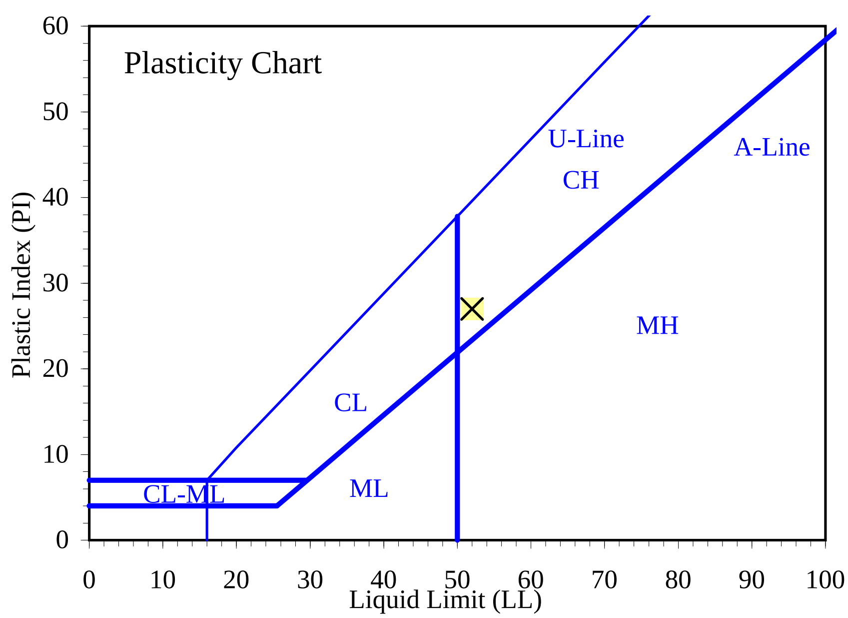
Determination No	1	2			
Wet Soil + Tare (g)	35.99	35.26			
Dry Soil + Tare (g)	33.14	32.57			
Moisture Loss (g)	2.85	2.69			
Tare (g)	21.72	21.68			
Dry Soil (g)	11.42	10.89			
Water Content, w (%)	24.96	24.70			

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	33	22	18			
Wet Soil + Tare (g)	34.99	33.59	34.50			
Dry Soil + Tare (g)	30.59	29.59	30.10			
Moisture Loss (g)	4.40	4.00	4.40			
Tare (g)	21.87	21.88	21.81			
Dry Soil (g)	8.72	7.71	8.29			
Water Content, w (%)	50.46	51.88	53.08			
One-Point LL (%)		51				

Liquid Limit, LL (%)	**52**
Plastic Limit, PL (%)	**25**
Plasticity Index, PI (%)	**27**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

IGES

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/22/2013
By: DKS

Boring No.: B-08
Sample:
Depth: 14.5'
Description: Grey fat clay

Preparation method: Wet
Liquid limit test method: Multipoint

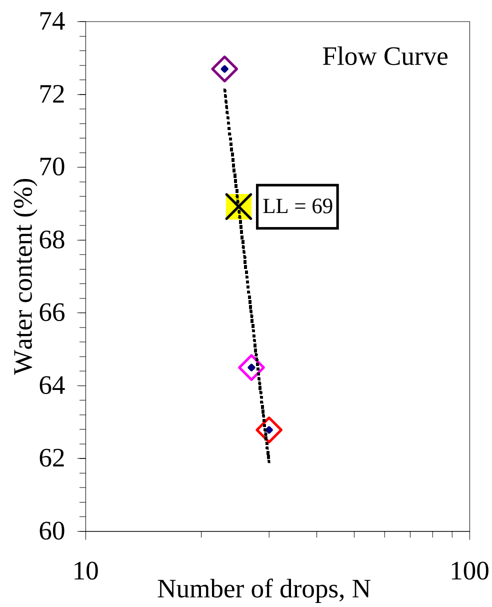
Plastic Limit

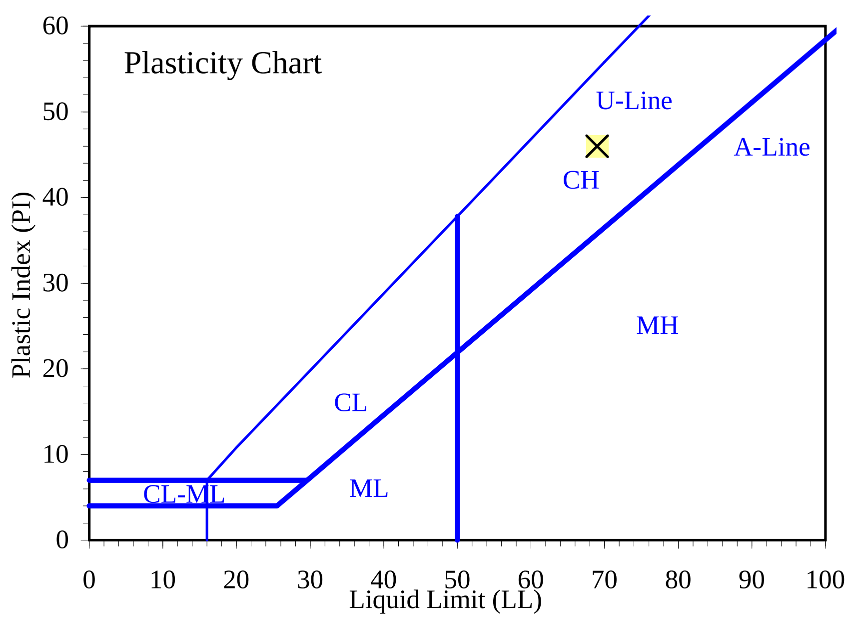
Determination No	1	2			
Wet Soil + Tare (g)	34.94	33.66			
Dry Soil + Tare (g)	32.41	31.39			
Moisture Loss (g)	2.53	2.27			
Tare (g)	21.72	21.49			
Dry Soil (g)	10.69	9.90			
Water Content, w (%)	23.67	22.93			

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	30	27	23			
Wet Soil + Tare (g)	34.50	33.64	35.53			
Dry Soil + Tare (g)	29.59	29.08	30.23			
Moisture Loss (g)	4.91	4.56	5.30			
Tare (g)	21.77	22.01	22.94			
Dry Soil (g)	7.82	7.07	7.29			
Water Content, w (%)	62.79	64.50	72.70			
One-Point LL (%)	64	65	72			

Liquid Limit, LL (%)	**69**
Plastic Limit, PL (%)	**23**
Plasticity Index, PI (%)	**46**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

IGES

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/21/2013
By: DKS

Boring No.: B-08
Sample:
Depth: 24.5'
Description: Dark grey fat clay

Preparation method: Wet
Liquid limit test method: Multipoint

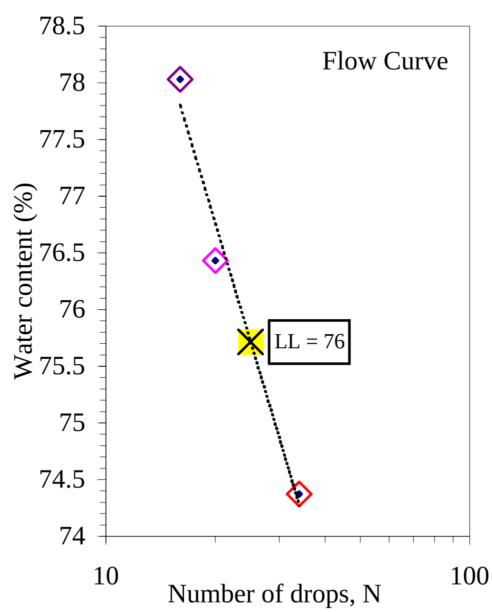
Plastic Limit

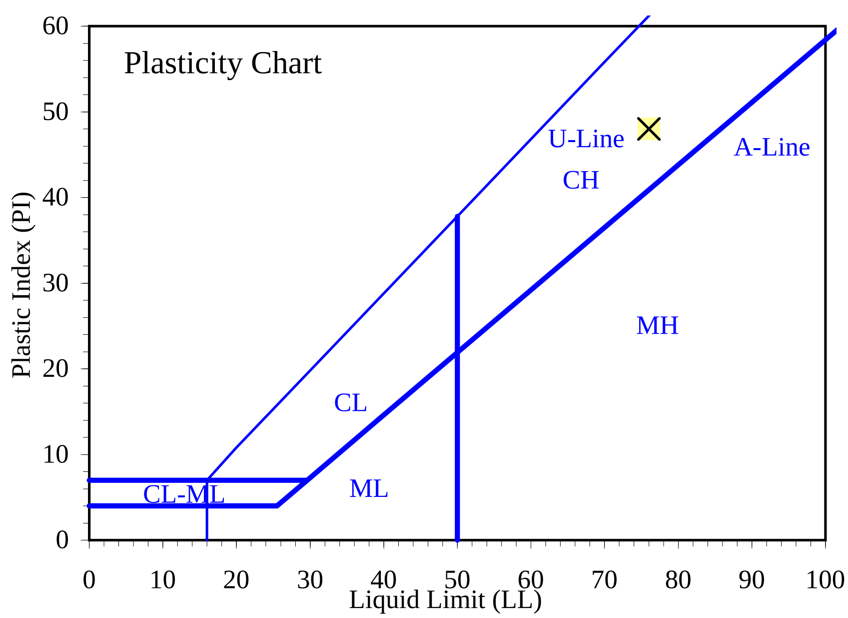
Determination No	1	2			
Wet Soil + Tare (g)	35.91	35.95			
Dry Soil + Tare (g)	32.81	32.80			
Moisture Loss (g)	3.10	3.15			
Tare (g)	21.67	21.58			
Dry Soil (g)	11.14	11.22			
Water Content, w (%)	27.83	28.07			

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	34	20	16			
Wet Soil + Tare (g)	33.37	32.18	31.89			
Dry Soil + Tare (g)	28.32	27.64	27.45			
Moisture Loss (g)	5.05	4.54	4.44			
Tare (g)	21.53	21.70	21.76			
Dry Soil (g)	6.79	5.94	5.69			
Water Content, w (%)	74.37	76.43	78.03			
One-Point LL (%)		74				

Liquid Limit, LL (%)	**76**
Plastic Limit, PL (%)	**28**
Plasticity Index, PI (%)	**48**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils
(ASTM D4318)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/22/2013
By: DKS

Boring No.: B-08
Sample:
Depth: 29.5'
Description: Grey fat clay

Preparation method: Wet
Liquid limit test method: Multipoint

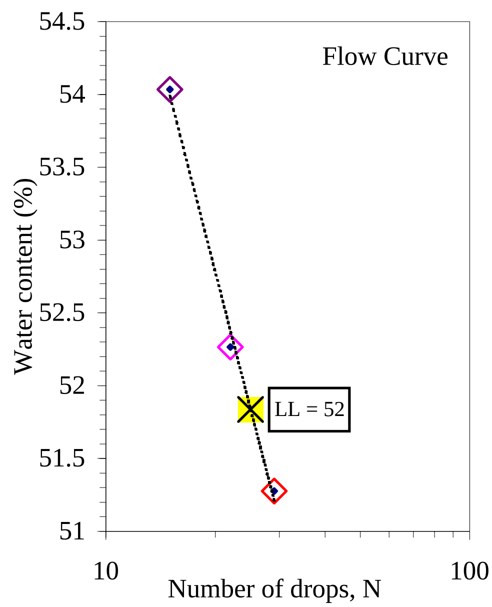
Plastic Limit

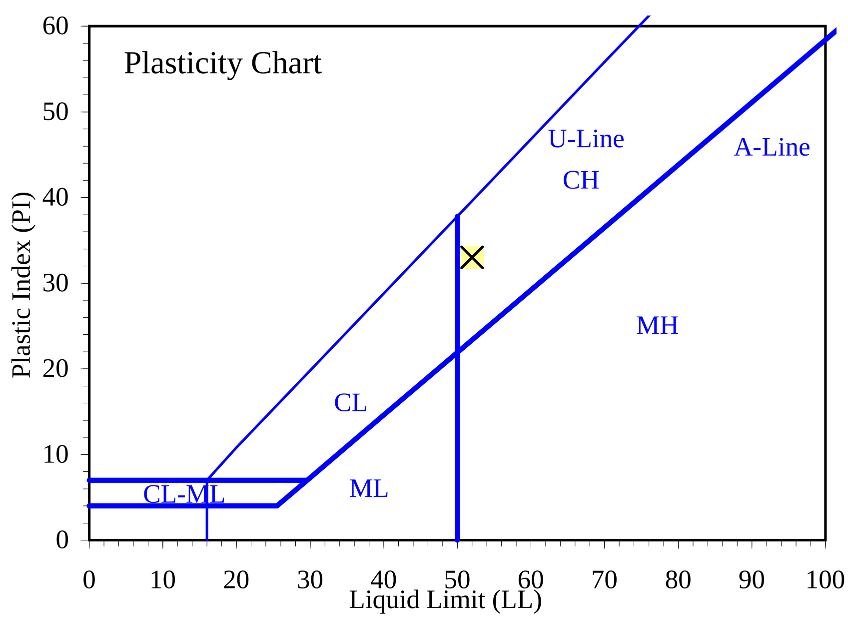
Determination No	1	2			
Wet Soil + Tare (g)	33.48	35.77			
Dry Soil + Tare (g)	31.63	33.45			
Moisture Loss (g)	1.85	2.32			
Tare (g)	22.00	21.45			
Dry Soil (g)	9.63	12.00			
Water Content, w (%)	19.21	19.33			

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	29	22	15			
Wet Soil + Tare (g)	37.99	35.48	34.46			
Dry Soil + Tare (g)	32.37	30.75	30.04			
Moisture Loss (g)	5.62	4.73	4.42			
Tare (g)	21.41	21.70	21.86			
Dry Soil (g)	10.96	9.05	8.18			
Water Content, w (%)	51.28	52.27	54.03			
One-Point LL (%)	52	51				

Liquid Limit, LL (%)	**52**
Plastic Limit, PL (%)	**19**
Plasticity Index, PI (%)	**33**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

IGES

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/22/2013
By: DKS

Boring No.: B-09
Sample:
Depth: 14.5'
Description: Brown fat clay

Preparation method: Wet
Liquid limit test method: Multipoint

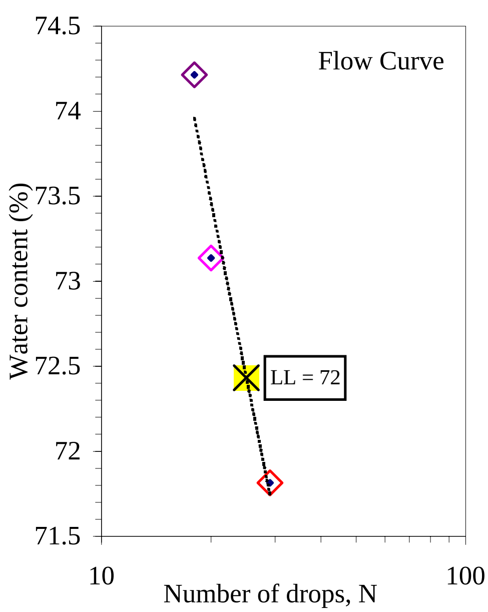
Plastic Limit

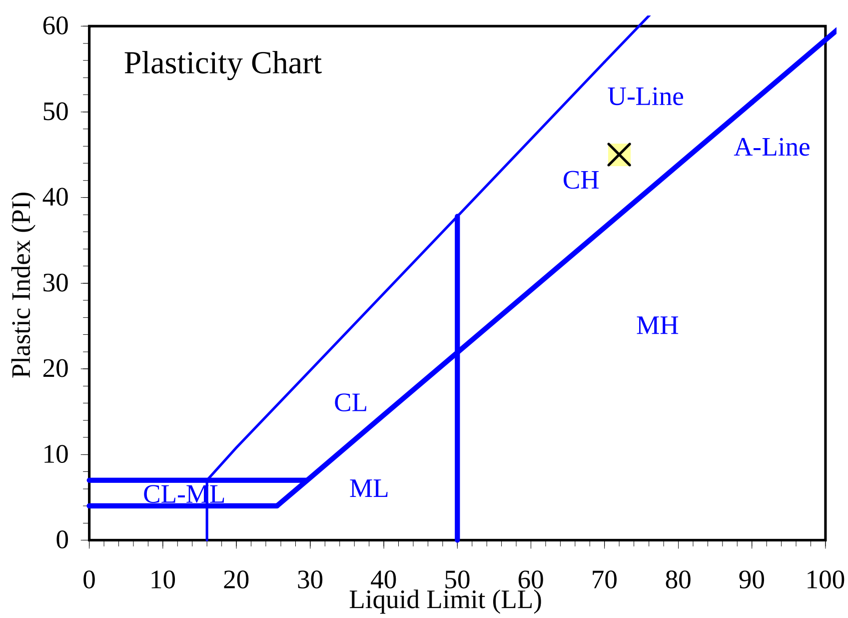
Determination No	1	2			
Wet Soil + Tare (g)	35.96	36.01			
Dry Soil + Tare (g)	32.92	32.88			
Moisture Loss (g)	3.04	3.13			
Tare (g)	21.92	21.24			
Dry Soil (g)	11.00	11.64			
Water Content, w (%)	27.64	26.89			

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	29	20	18			
Wet Soil + Tare (g)	32.25	33.09	35.05			
Dry Soil + Tare (g)	27.74	28.38	29.38			
Moisture Loss (g)	4.51	4.71	5.67			
Tare (g)	21.46	21.94	21.74			
Dry Soil (g)	6.28	6.44	7.64			
Water Content, w (%)	71.82	73.14	74.21			
One-Point LL (%)	73	71				

Liquid Limit, LL (%)	**72**
Plastic Limit, PL (%)	**27**
Plasticity Index, PI (%)	**45**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

IGES

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/26/2013
By: DKS

Boring No.: B-09
Sample:
Depth: 24.5'
Description: Light grey lean clay

Preparation method: Wet
Liquid limit test method: Multipoint

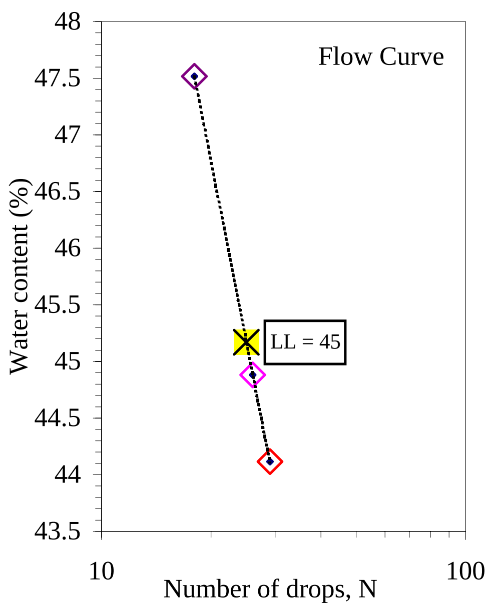
Plastic Limit

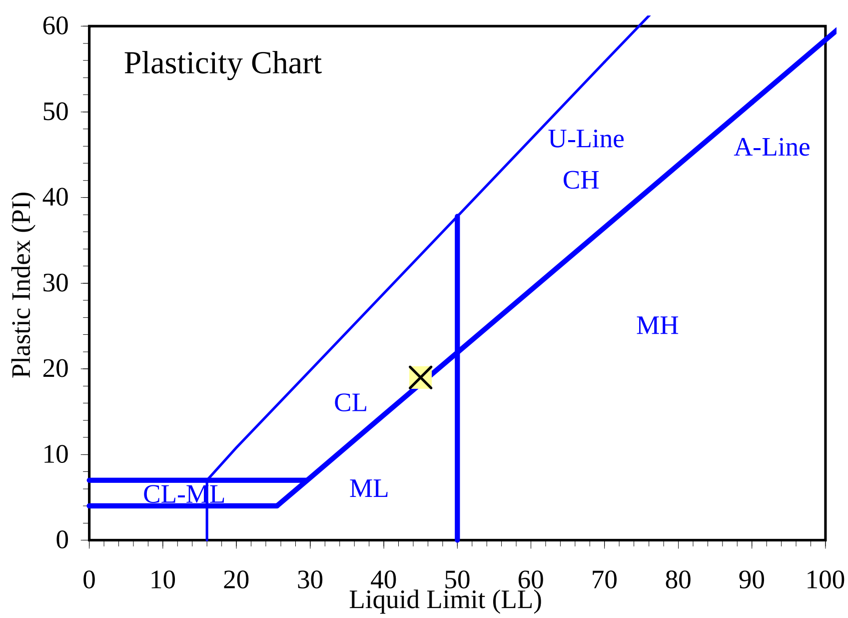
Determination No	1	2			
Wet Soil + Tare (g)	34.54	32.53			
Dry Soil + Tare (g)	31.86	30.22			
Moisture Loss (g)	2.68	2.31			
Tare (g)	21.64	21.25			
Dry Soil (g)	10.22	8.97			
Water Content, w (%)	26.22	25.75			

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	29	26	18			
Wet Soil + Tare (g)	37.04	34.62	33.19			
Dry Soil + Tare (g)	32.43	30.63	29.65			
Moisture Loss (g)	4.61	3.99	3.54			
Tare (g)	21.98	21.74	22.20			
Dry Soil (g)	10.45	8.89	7.45			
Water Content, w (%)	44.11	44.88	47.52			
One-Point LL (%)	45	45				

Liquid Limit, LL (%)	**45**
Plastic Limit, PL (%)	**26**
Plasticity Index, PI (%)	**19**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/26/2013
By: DKS

Boring No.: B-09
Sample:
Depth: 39.5'
Description: Light grey lean clay

Preparation method: Air Dry
Liquid limit test method: Multipoint

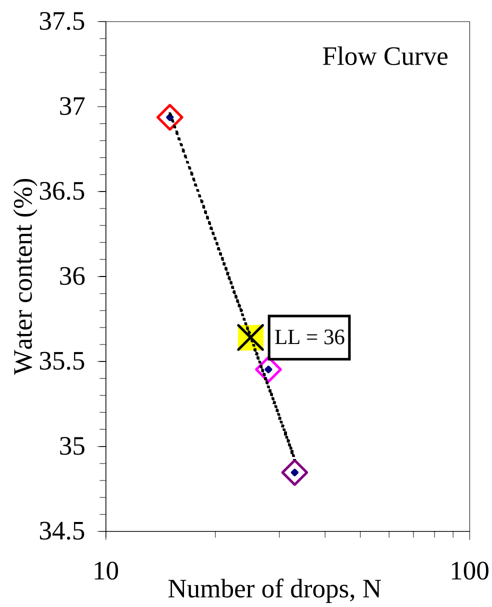
Plastic Limit

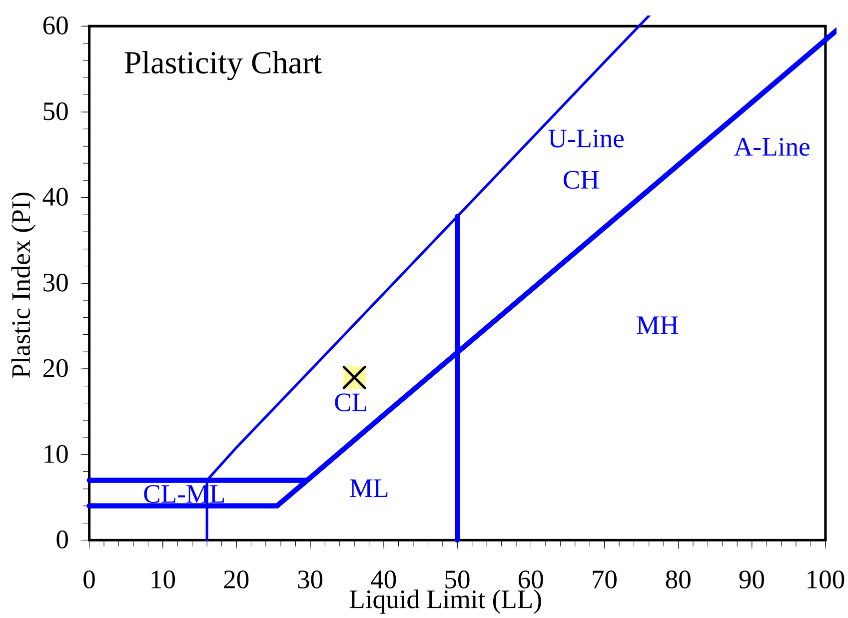
Determination No	1	2				
Wet Soil + Tare (g)	34.26	33.48				
Dry Soil + Tare (g)	32.41	31.77				
Moisture Loss (g)	1.85	1.71				
Tare (g)	21.52	21.56				
Dry Soil (g)	10.89	10.21				
Water Content, w (%)	16.99	16.75				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	15	28	33			
Wet Soil + Tare (g)	33.99	34.52	36.79			
Dry Soil + Tare (g)	30.71	31.23	32.95			
Moisture Loss (g)	3.28	3.29	3.84			
Tare (g)	21.83	21.95	21.93			
Dry Soil (g)	8.88	9.28	11.02			
Water Content, w (%)	36.94	35.45	34.85			
One-Point LL (%)		36				

Liquid Limit, LL (%)	**36**
Plastic Limit, PL (%)	**17**
Plasticity Index, PI (%)	**19**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/26/2013
By: DKS

Boring No.: B-11
Sample:
Depth: 14.5'
Description: Grey fat clay

Preparation method: Wet
Liquid limit test method: Multipoint

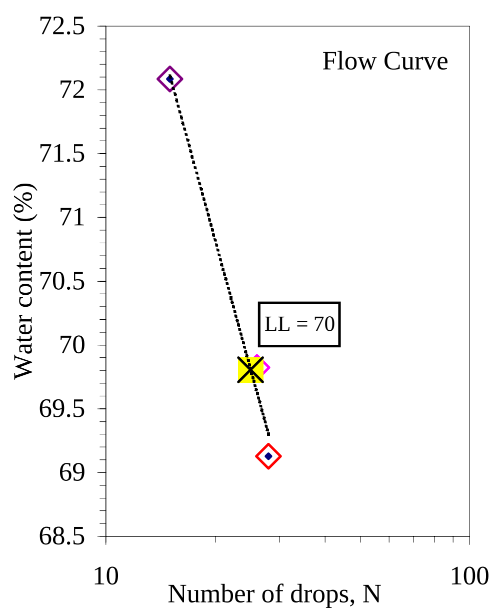
Plastic Limit

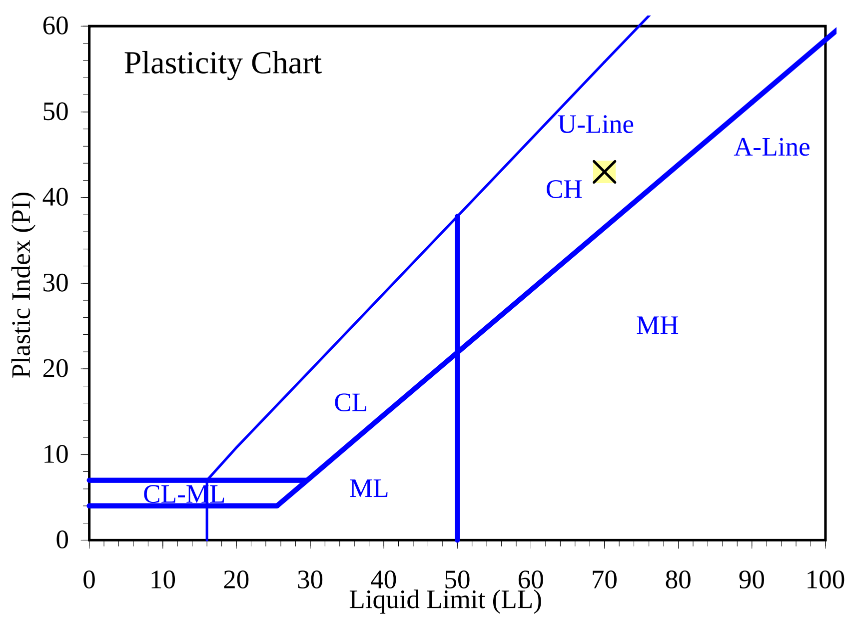
Determination No	1	2				
Wet Soil + Tare (g)	35.91	34.45				
Dry Soil + Tare (g)	32.81	31.81				
Moisture Loss (g)	3.10	2.64				
Tare (g)	21.59	21.82				
Dry Soil (g)	11.22	9.99				
Water Content, w (%)	27.63	26.43				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	28	26	15			
Wet Soil + Tare (g)	32.93	33.56	34.55			
Dry Soil + Tare (g)	28.34	28.84	29.23			
Moisture Loss (g)	4.59	4.72	5.32			
Tare (g)	21.70	22.08	21.85			
Dry Soil (g)	6.64	6.76	7.38			
Water Content, w (%)	69.13	69.82	72.09			
One-Point LL (%)	70	70				

Liquid Limit, LL (%)	**70**
Plastic Limit, PL (%)	**27**
Plasticity Index, PI (%)	**43**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/27/2013
By: DKS

Boring No.: B-12
Sample:
Depth: 5.0'
Description: Brown fat clay

Preparation method: Wet
Liquid limit test method: Multipoint

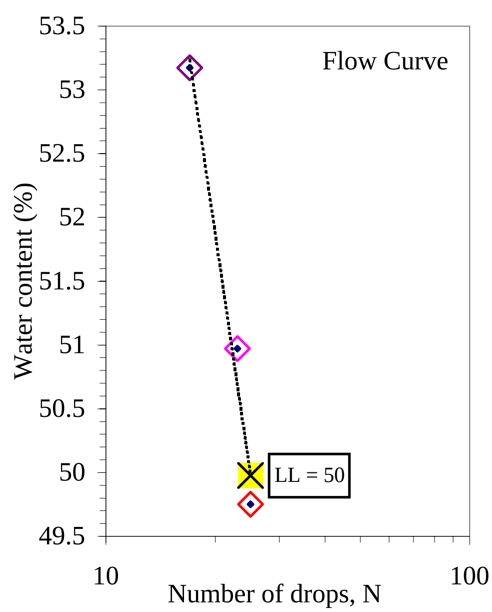
Plastic Limit

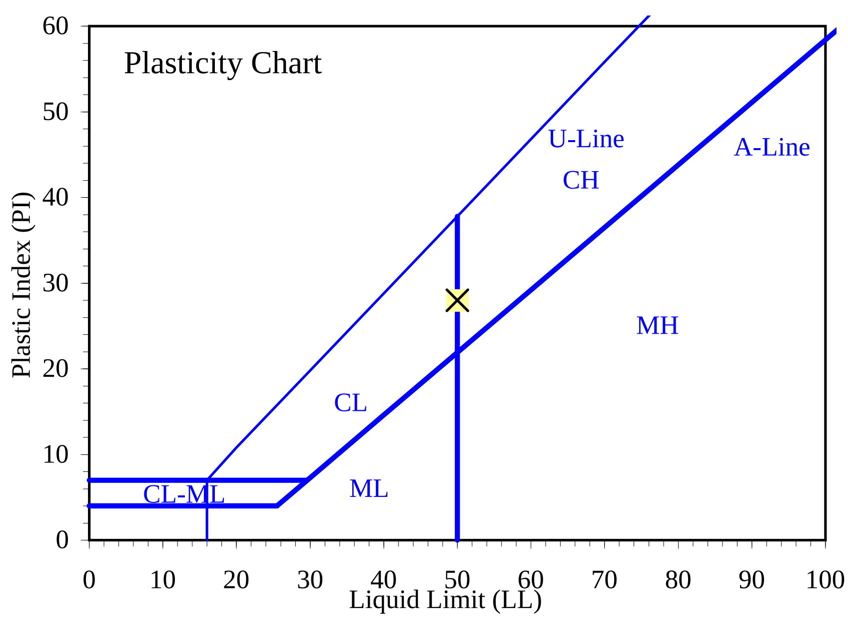
Determination No	1	2			
Wet Soil + Tare (g)	32.20	34.56			
Dry Soil + Tare (g)	30.32	32.22			
Moisture Loss (g)	1.88	2.34			
Tare (g)	21.65	21.54			
Dry Soil (g)	8.67	10.68			
Water Content, w (%)	21.68	21.91			

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	25	23	17			
Wet Soil + Tare (g)	33.65	37.65	35.17			
Dry Soil + Tare (g)	29.64	32.40	30.48			
Moisture Loss (g)	4.01	5.25	4.69			
Tare (g)	21.58	22.10	21.66			
Dry Soil (g)	8.06	10.30	8.82			
Water Content, w (%)	49.75	50.97	53.17			
One-Point LL (%)	50	50				

Liquid Limit, LL (%)	**50**
Plastic Limit, PL (%)	**22**
Plasticity Index, PI (%)	**28**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/27/2013
By: DKS

Boring No.: B-12
Sample:
Depth: 24.5'
Description: Light grey fat clay

Preparation method: Air Dry
Liquid limit test method: Multipoint

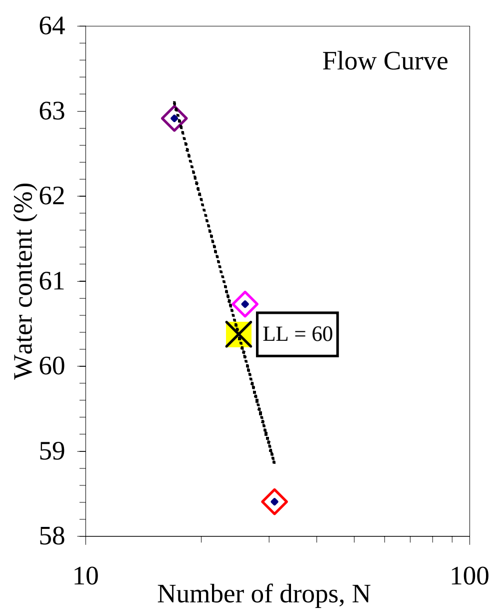
Plastic Limit

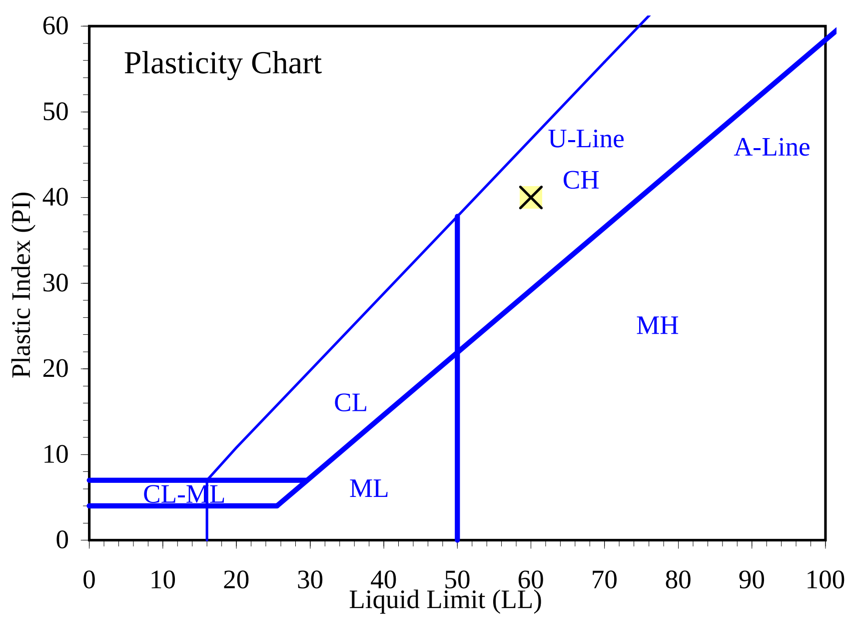
Determination No	1	2			
Wet Soil + Tare (g)	35.48	34.34			
Dry Soil + Tare (g)	33.15	32.23			
Moisture Loss (g)	2.33	2.11			
Tare (g)	21.75	21.68			
Dry Soil (g)	11.40	10.55			
Water Content, w (%)	20.44	20.00			

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	31	26	17			
Wet Soil + Tare (g)	34.57	33.96	35.30			
Dry Soil + Tare (g)	29.88	29.15	29.99			
Moisture Loss (g)	4.69	4.81	5.31			
Tare (g)	21.85	21.23	21.55			
Dry Soil (g)	8.03	7.92	8.44			
Water Content, w (%)	58.41	60.73	62.91			
One-Point LL (%)		61				

Liquid Limit, LL (%)	**60**
Plastic Limit, PL (%)	**20**
Plasticity Index, PI (%)	**40**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/21/2013
By: DKS

Boring No.: B-12
Sample:
Depth: 44.5'
Description: Light grey lean clay

Preparation method: Wet
Liquid limit test method: Multipoint

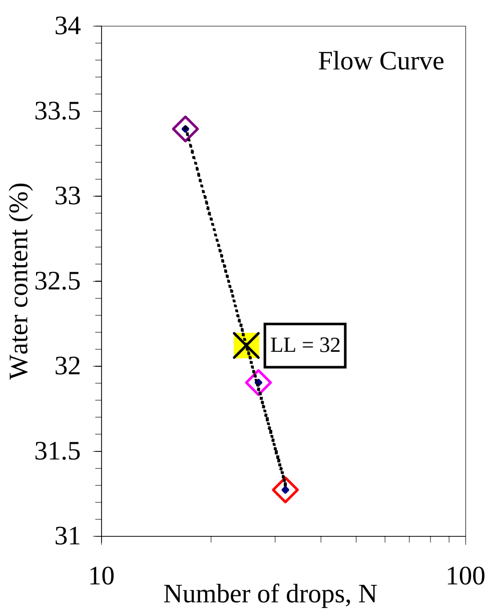
Plastic Limit

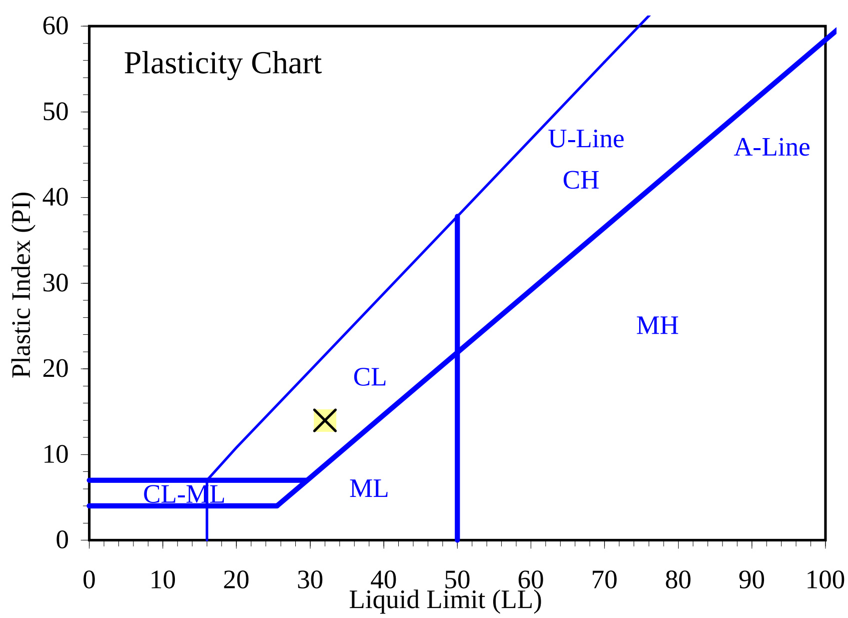
Determination No	1	2			
Wet Soil + Tare (g)	37.76	39.88			
Dry Soil + Tare (g)	35.23	37.11			
Moisture Loss (g)	2.53	2.77			
Tare (g)	21.45	21.84			
Dry Soil (g)	13.78	15.27			
Water Content, w (%)	18.36	18.14			

Liquid Limit

Determination No	1	2	3		
Number of Drops, N	32	27	17		
Wet Soil + Tare (g)	36.00	38.25	36.04		
Dry Soil + Tare (g)	32.61	34.23	32.45		
Moisture Loss (g)	3.39	4.02	3.59		
Tare (g)	21.77	21.63	21.70		
Dry Soil (g)	10.84	12.60	10.75		
Water Content, w (%)	31.27	31.90	33.40		
One-Point LL (%)		32			

Liquid Limit, LL (%)	**32**
Plastic Limit, PL (%)	**18**
Plasticity Index, PI (%)	**14**





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Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

Project: Logan WWTP
No: 00823-012
Location: Logan, UT
Date: 2/18/2013
By: Dks

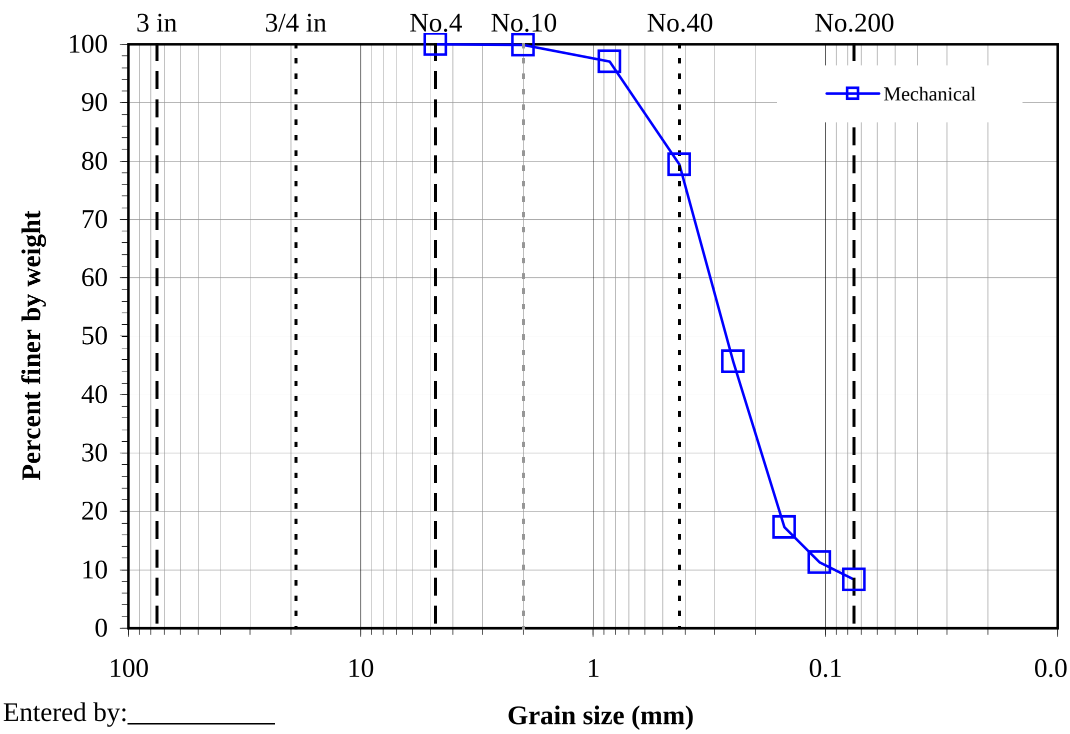
Boring No.: B-02
Sample:
Depth: 34.5'
Description: Grey sand with silt

Split:	No		
	-		
	Moist	Dry	
Total sample wt. (g):	396.71	313.3	
Split fraction:	1.000		

Water content data

Moist soil + tare (g):	-	520.53
Dry soil + tare (g):	-	437.08
Tare (g):	-	123.82
Water content (%):	0.0	26.6

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer
8"	-	200	-
6"	-	150	-
4"	-	100	-
3"	-	75	-
1.5"	-	37.5	-
3/4"	-	19	-
3/8"	-	9.5	-
No.4	-	4.75	100.0
No.10	0.51	2	99.8
No.20	9.25	0.85	97.0
No.40	64.36	0.425	79.5
No.60	170.34	0.25	45.6
No.100	259.20	0.15	17.3
No.140	277.93	0.106	11.3
No.200	287.24	0.075	8.3



Gravel (%): 0.0
Sand (%): 91.7
Fines (%): 8.3

Entered by:___________
Reviewed:___________

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Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

Project: Logan WWTP
No: 00823-012
Location: Logan, UT
Date: 2/18/2013
By: DKS

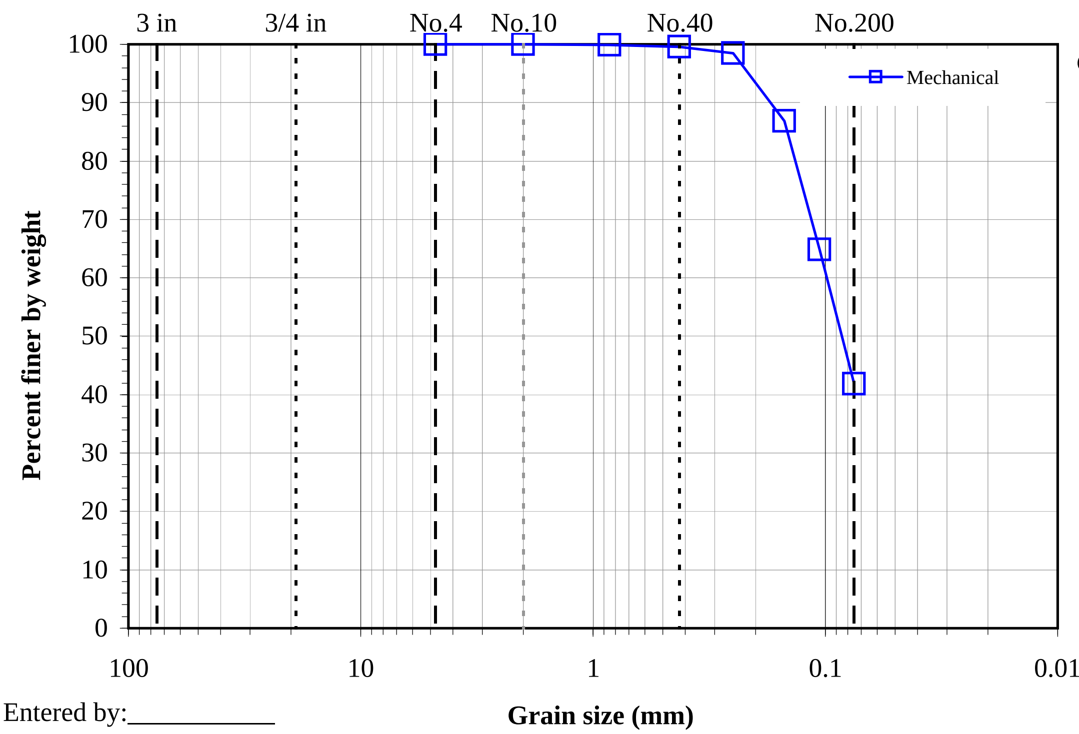
Boring No.: B-07
Sample: B
Depth: 29.5'
Description: Grey silty sand

Split:	No	
	-	
	Moist	Dry
Total sample wt. (g):	321.91	251.2
Split fraction:	1.000	

Water content data

Moist soil + tare (g):	-	444.22
Dry soil + tare (g):	-	373.48
Tare (g):	-	122.31
Water content (%):	0.0	28.2

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer
8"	-	200	-
6"	-	150	-
4"	-	100	-
3"	-	75	-
1.5"	-	37.5	-
3/4"	-	19	-
3/8"	-	9.5	-
No.4	-	4.75	100.0
No.10	0.01	2	100.0
No.20	0.28	0.85	99.9
No.40	1.09	0.425	99.6
No.60	3.88	0.25	98.5
No.100	33.02	0.15	86.9
No.140	88.26	0.106	64.9
No.200	146.12	0.075	41.8



Gravel (%): 0.0
Sand (%): 58.2
Fines (%): 41.8

Entered by:___________
Reviewed:___________

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

Project: Logan WWTP
No: 00823-012
Location: Logan, UT
Date: 2/22/2013
By: DKS

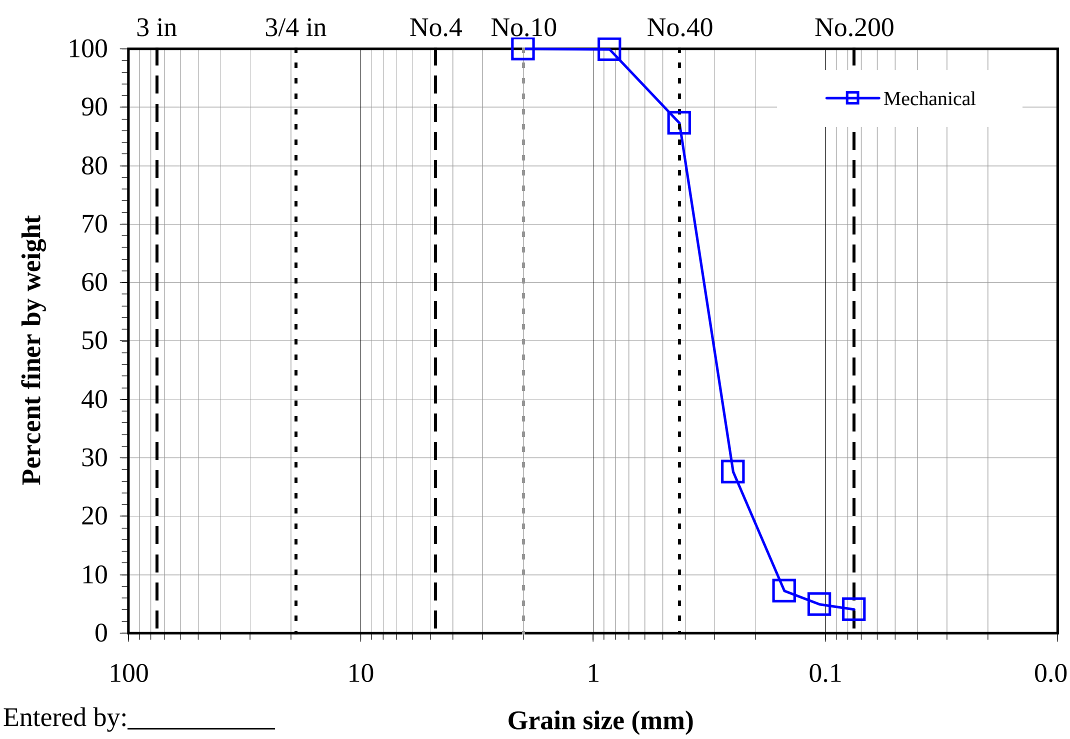
Boring No.: B-07
Sample:
Depth: 34.5'
Description: Grey sand

Split:	No	
	-	
	Moist	Dry
Total sample wt. (g):	412.11	319.5
Split fraction:	1.000	

Water content data

Moist soil + tare (g):	-	540.47
Dry soil + tare (g):	-	447.85
Tare (g):	-	128.36
Water content (%):	0.0	29.0

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer
8"	-	200	-
6"	-	150	-
4"	-	100	-
3"	-	75	-
1.5"	-	37.5	-
3/4"	-	19	-
3/8"	-	9.5	-
No.4	-	4.75	-
No.10	-	2	100.0
No.20	0.46	0.85	99.9
No.40	40.76	0.425	87.2
No.60	231.17	0.25	27.6
No.100	296.41	0.15	7.2
No.140	303.84	0.106	4.9
No.200	306.64	0.075	4.0



Gravel (%): 0.0
Sand (%): 96.0
Fines (%): 4.0

Entered by:___________
Reviewed:___________

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

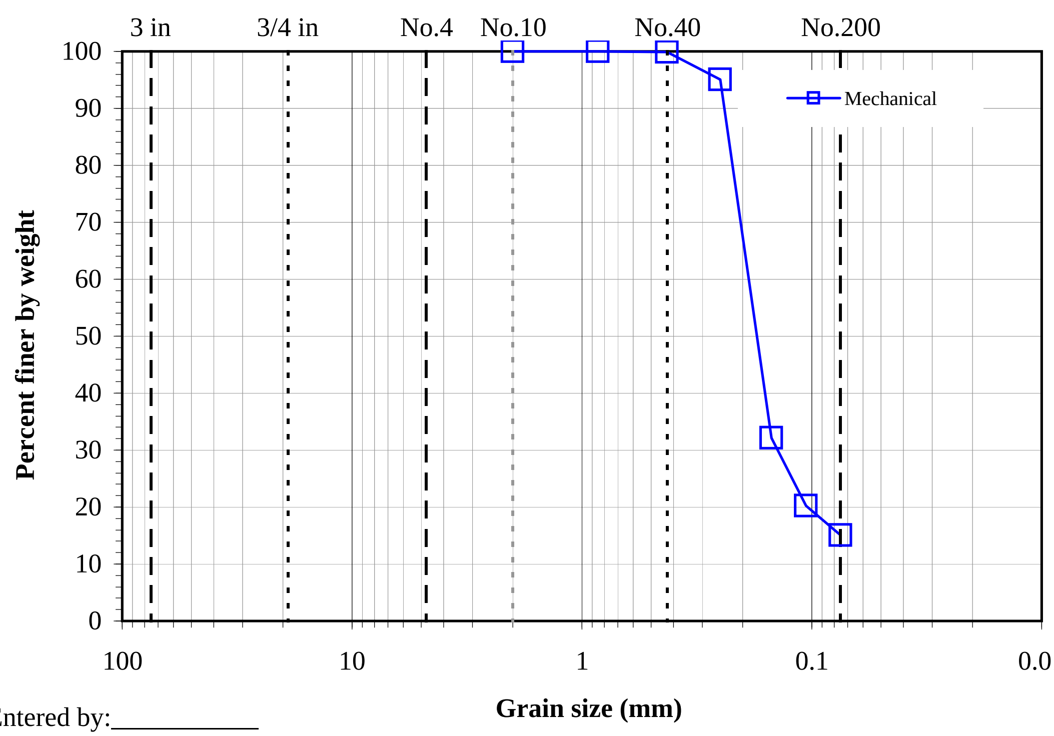
(ASTM D6913)

Project:	**Logan WWTP**	**Boring No.:**	**B-07**
No:	**00823-012**	**Sample:**	
Location:	Logan, UT	**Depth:**	**49.5'**
Date:	2/27/2013	Description:	Grey silty sand
By:	JDF		

Split:	No	
	-	
	Moist	Dry
Total sample wt. (g):	572.88	436.1
Split fraction:	1.000	

Water content data		
Moist soil + tare (g):	-	700.30
Dry soil + tare (g):	-	563.49
Tare (g):	-	127.42
Water content (%):	0.0	31.4

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer
8"	-	200	-
6"	-	150	-
4"	-	100	-
3"	-	75	-
1.5"	-	37.5	-
3/4"	-	19	-
3/8"	-	9.5	-
No.4	-	4.75	-
No.10	-	2	100.0
No.20	0.15	0.85	100.0
No.40	0.62	0.425	99.9
No.60	21.46	0.25	95.1
No.100	295.75	0.15	32.2
No.140	347.89	0.106	20.2
No.200	370.63	0.075	15.0



Gravel (%): 0.0
Sand (%): 85.0
Fines (%): 15.0

Entered by:___________
Reviewed:___________

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

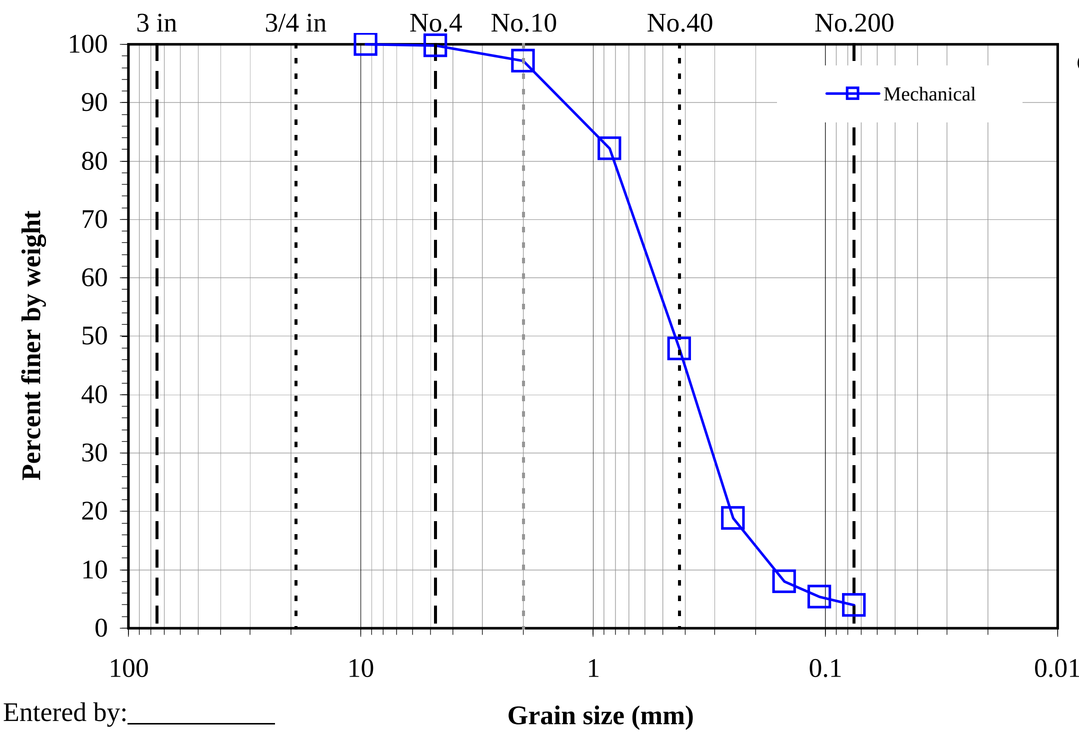
Project: Logan WWTP
No: 00823-012
Location: Logan, UT
Date: 2/22/2013
By: DKS

Boring No.: B-08
Sample:
Depth: 34.5'
Description: Grey sand

Split:	No	
	-	
	Moist	Dry
Total sample wt. (g):	355.19	284.0
Split fraction:	1.000	

Water content data		
Moist soil + tare (g):	-	530.91
Dry soil + tare (g):	-	459.67
Tare (g):	-	175.72
Water content (%):	0.0	25.1

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer
8"	-	200	-
6"	-	150	-
4"	-	100	-
3"	-	75	-
1.5"	-	37.5	-
3/4"	-	19	-
3/8"	-	9.5	100.0
No.4	0.56	4.75	99.8
No.10	8.00	2	97.2
No.20	50.57	0.85	82.2
No.40	148.16	0.425	47.8
No.60	230.49	0.25	18.8
No.100	261.38	0.15	7.9
No.140	268.78	0.106	5.3
No.200	272.77	0.075	3.9



Gravel (%): 0.2
Sand (%): 95.9
Fines (%): 3.9

Entered by:___________
Reviewed:___________

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Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

Project: Logan WWTP
No: 00823-012
Location: Logan, UT
Date: 2/27/2013
By: JDF

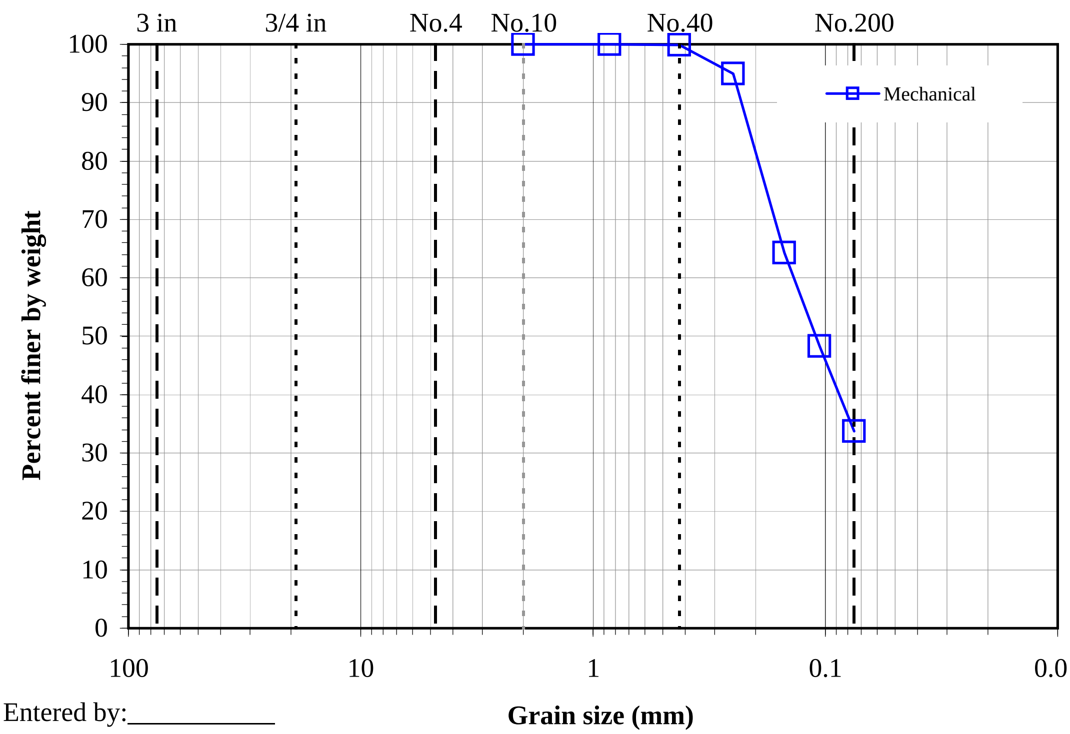
Boring No.: B-11
Sample:
Depth: 44.5'
Description: Grey silty sand

Split:	No	
	-	
	Moist	Dry
Total sample wt. (g):	614.07	497.6
Split fraction:	1.000	

Water content data

Moist soil + tare (g):	-	735.04
Dry soil + tare (g):	-	618.53
Tare (g):	-	120.97
Water content (%):	0.0	23.4

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer
8"	-	200	-
6"	-	150	-
4"	-	100	-
3"	-	75	-
1.5"	-	37.5	-
3/4"	-	19	-
3/8"	-	9.5	-
No.4	-	4.75	-
No.10	-	2	100.0
No.20	0.05	0.85	100.0
No.40	0.40	0.425	99.9
No.60	24.88	0.25	95.0
No.100	177.72	0.15	64.3
No.140	257.49	0.106	48.2
No.200	329.64	0.075	33.7



Gravel (%): 0.0
Sand (%): 66.3
Fines (%): 33.7

Entered by:___________
Reviewed:___________

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

Project: Logan WWTP
No: 00823-012
Location: Logan, UT
Date: 2/22/2013
By: DKS

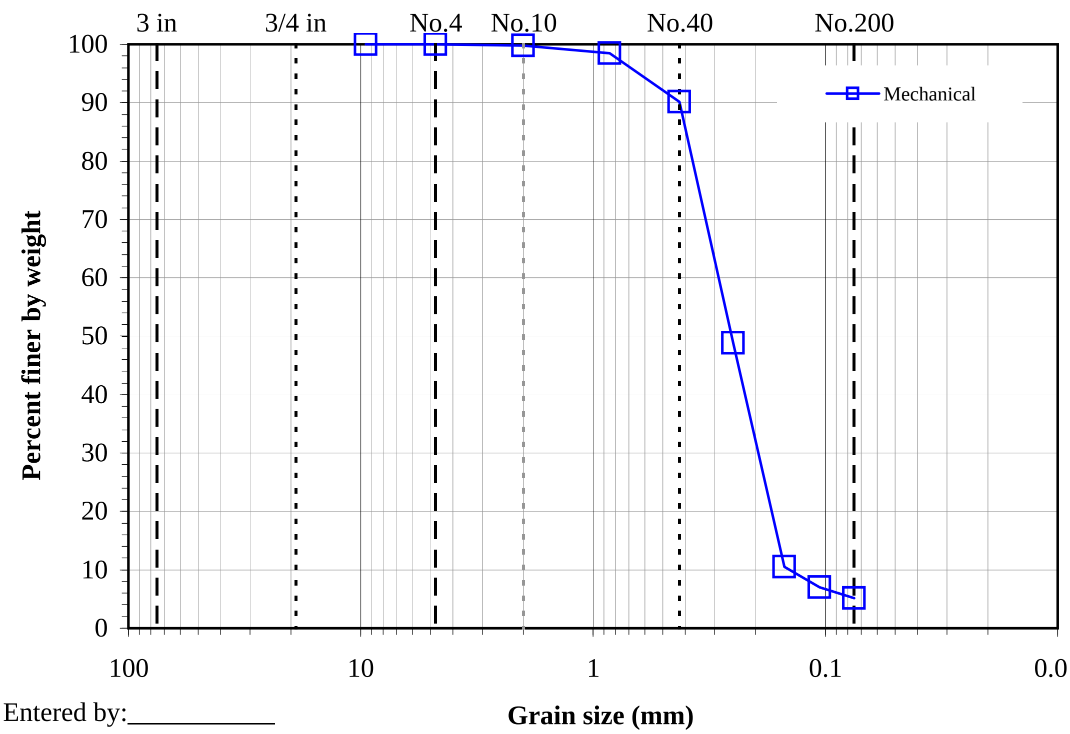
Boring No.: B-12
Sample: A
Depth: 44.5'
Description: Grey sand with silt

Split:	No	
	-	
	Moist	Dry
Total sample wt. (g):	322.65	251.8
Split fraction:	1.000	

Water content data

Moist soil + tare (g):	-	445.89
Dry soil + tare (g):	-	375.02
Tare (g):	-	123.24
Water content (%):	0.0	28.1

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer
8"	-	200	-
6"	-	150	-
4"	-	100	-
3"	-	75	-
1.5"	-	37.5	-
3/4"	-	19	-
3/8"	-	9.5	100.0
No.4	0.11	4.75	100.0
No.10	0.61	2	99.8
No.20	3.91	0.85	98.4
No.40	24.89	0.425	90.1
No.60	128.70	0.25	48.9
No.100	225.22	0.15	10.5
No.140	234.25	0.106	7.0
No.200	238.75	0.075	5.2



Gravel (%): 0.0
Sand (%): 94.8
Fines (%): 5.2

Entered by:___________
Reviewed:___________

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Amount of Material in Soil Finer than the No. 200 (75μm) Sieve

(ASTM D1140)

IGES

Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah
Date: 2/25/2013
By: MP

Sample Info.	Boring No.	B-01	B-01	B-01	B-02	B-02	B-05	B-05	B-05
	Sample								
	Depth	24.5'	39.5'	44.5'	24.5'	54.5'	19.5'	24.5'	59.5'
	Split	No	No	No	No	No	No	No	No
	Split Sieve*								
	Method	A	A	A	A	A	A	A	A
Moist total sample wt. (g)		233.67	376.95	889.38	231.55	395.99	162.01	324.87	280.51
Moist coarse fraction (g)									
Moist split fraction + tare (g)									
Split fraction tare (g)									
Dry split fraction (g)									
Dry retained No. 200 + tare (g)		137.34	189.03	674.05	125.49	259.90	127.58	173.07	132.19
Wash tare (g)		128.49	123.08	288.42	124.43	121.43	127.01	121.55	123.75
No. 200 Dry wt. retained (g)		8.85	65.95	385.63	1.06	138.47	0.57	51.52	8.44
Split sieve* Dry wt. retained (g)									
Dry total sample wt. (g)		132.43	300.84	717.77	134.62	314.92	97.05	252.72	211.85
Coarse Fraction	Moist soil + tare (g)								
	Dry soil + tare (g)								
	Tare (g)								
	Water content (%)								
Split Fraction	Moist soil + tare (g)	362.16	500.03	1177.80	355.98	517.42	289.02	446.42	404.26
	Dry soil + tare (g)	260.92	423.92	1006.19	259.05	436.35	224.06	374.27	335.60
	Tare (g)	128.49	123.08	288.42	124.43	121.43	127.01	121.55	123.75
	Water content (%)	76.45	25.30	23.91	72.00	25.74	66.93	28.55	32.41
Percent passing split sieve* (%)									
Percent passing No. 200 sieve (%)		**93.3**	**78.1**	**46.3**	**99.2**	**56.0**	**99.4**	**79.6**	**96.0**

Entered by:___________

Reviewed:___________

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Amount of Material in Soil Finer than the No. 200 (75µm) Sieve

(ASTM D1140)

IGES

Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah
Date: 2/25/2013
By: MP

Sample Info.	Boring No.	B-05	B-07	B-07	B-08	B-09	B-09	B-11	B-12
	Sample			A					
	Depth	69.5'	9.5'	29.5'	14.5'	14.5'	24.5'	14.5'	24.5'
	Split	No	No	No	No	No	No	No	No
	Split Sieve*								
	Method	A	A	A	A	A	A	A	A
	Moist total sample wt. (g)	233.52	393.89	213.56	255.24	338.11	263.43	322.18	331.59
	Moist coarse fraction (g)								
	Moist split fraction + tare (g)								
	Split fraction tare (g)								
	Dry split fraction (g)								
	Dry retained No. 200 + tare (g)	127.36	130.07	137.52	130.84	136.92	242.32	125.84	152.33
	Wash tare (g)	124.62	128.43	126.76	127.34	128.28	127.57	124.49	126.12
	No. 200 Dry wt. retained (g)	2.74	1.64	10.76	3.50	8.64	114.75	1.35	26.21
	Split sieve* Dry wt. retained (g)								
	Dry total sample wt. (g)	168.10	292.46	167.83	168.69	236.62	189.42	214.58	252.02
Coarse Fraction	Moist soil + tare (g)								
	Dry soil + tare (g)								
	Tare (g)								
	Water content (%)								
Split Fraction	Moist soil + tare (g)	358.14	522.32	340.32	382.58	466.39	391.00	446.67	457.71
	Dry soil + tare (g)	292.72	420.89	294.59	296.03	364.90	316.99	339.07	378.14
	Tare (g)	124.62	128.43	126.76	127.34	128.28	127.57	124.49	126.12
	Water content (%)	38.92	34.68	27.25	51.31	42.89	39.07	50.14	31.57
	Percent passing split sieve* (%)								
	Percent passing No. 200 sieve (%)	**98.4**	**99.4**	**93.6**	**97.9**	**96.3**	**39.4**	**99.4**	**89.6**

Entered by:___________

Reviewed:___________

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One-Dimensional Consolidation Properties of Soils

(*ASTM D2435*)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 3/1/2013
By: JDF

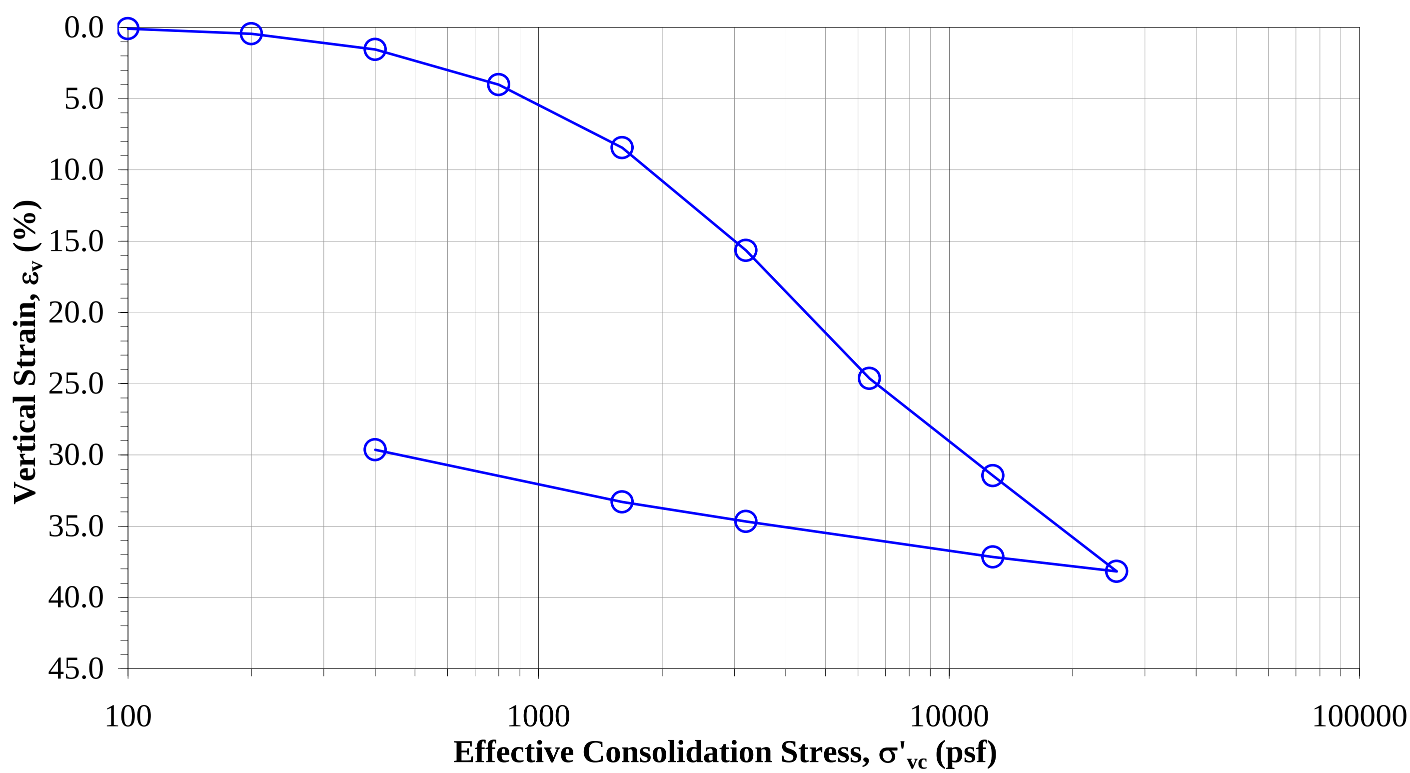
Boring No.: B-01
Sample:
Depth: 24.5'
Sample Description: Grey clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Consolidometer No.:	7	
Test method:	A	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.7036
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	162.08	140.31
Wt. rings/tare (g)	43.53	43.53
Moist unit wt., γ_m (pcf)	98.5	114.3
Wet soil + tare (g)	362.16	
Dry soil + tare (g)	260.92	
Tare (g)	128.49	
Water content, w (%)	76.4	44.0
Dry unit wt., γ_d (pcf)	55.8	79.3
Saturation	1.00	1.00

*Note: c_v, c_c, c_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0181	0.00	1.0000	1.985
100	0.0190	0.09	0.9991	1.983
200	0.0227	0.46	0.9954	1.972
400	0.0336	1.55	0.9845	1.939
800	0.0583	4.02	0.9598	1.865
1600	0.1025	8.44	0.9156	1.733
3200	0.1747	15.66	0.8434	1.518
6400	0.2645	24.64	0.7536	1.250
12800	0.3327	31.46	0.6854	1.046
25600	0.3999	38.18	0.6182	0.846
12800	0.3897	37.16	0.6284	0.876
3200	0.3649	34.68	0.6532	0.950
1600	0.3512	33.31	0.6669	0.991
400	0.3145	29.64	0.7036	1.101



Entered: ________
Reviewed: ________

One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/27/2013
By: JDF

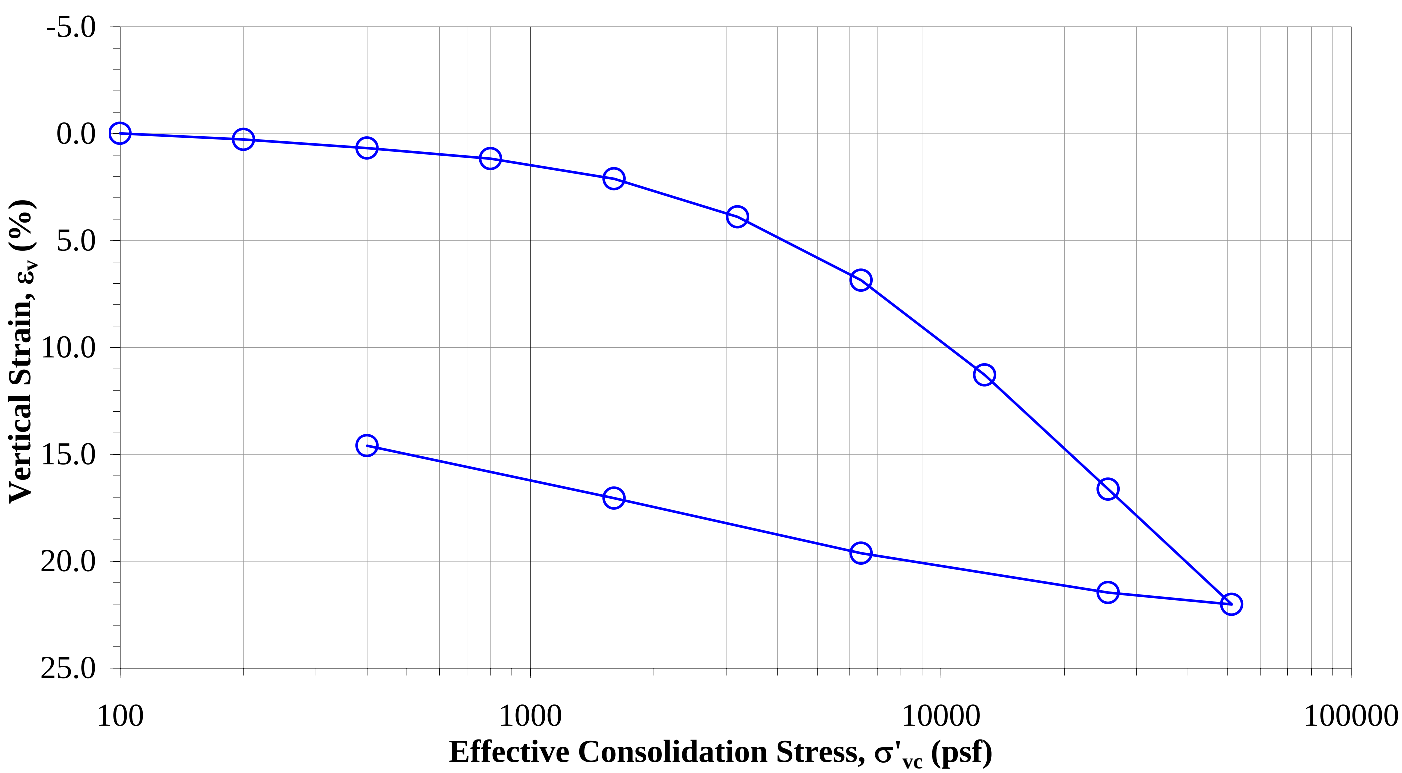
Boring No.: B-05
Sample:
Depth: 69.5'
Sample Description: Grey clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Consolidometer No.:	1	
Test method:	A	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.8541
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	182.61	172.88
Wt. rings/tare (g)	43.52	43.52
Moist unit wt., γ_m (pcf)	115.6	125.9
Wet soil + tare (g)	358.14	
Dry soil + tare (g)	292.72	
Tare (g)	124.62	
Water content, w (%)	38.9	29.2
Dry unit wt., γ_d (pcf)	83.2	97.4
Saturation	1.00	1.00

*Note: c_v, c_c, c_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0478	0.00	1.0000	1.003
100	0.0477	-0.01	1.0001	1.004
200	0.0505	0.27	0.9973	0.998
400	0.0545	0.67	0.9933	0.990
800	0.0595	1.17	0.9883	0.980
1600	0.0689	2.11	0.9789	0.961
3200	0.0867	3.89	0.9611	0.925
6400	0.1164	6.86	0.9314	0.866
12800	0.1606	11.28	0.8872	0.777
25600	0.2141	16.63	0.8337	0.670
51200	0.2680	22.02	0.7798	0.562
25600	0.2625	21.47	0.7853	0.573
6400	0.2440	19.62	0.8038	0.610
1600	0.2183	17.05	0.8295	0.662
400	0.1937	14.59	0.8541	0.711



Comments: Specimen swelled upon inundation and at 100 psf loading.

Entered: ________
Reviewed: ________

One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah
Date: 3/1/2013
By: JDF

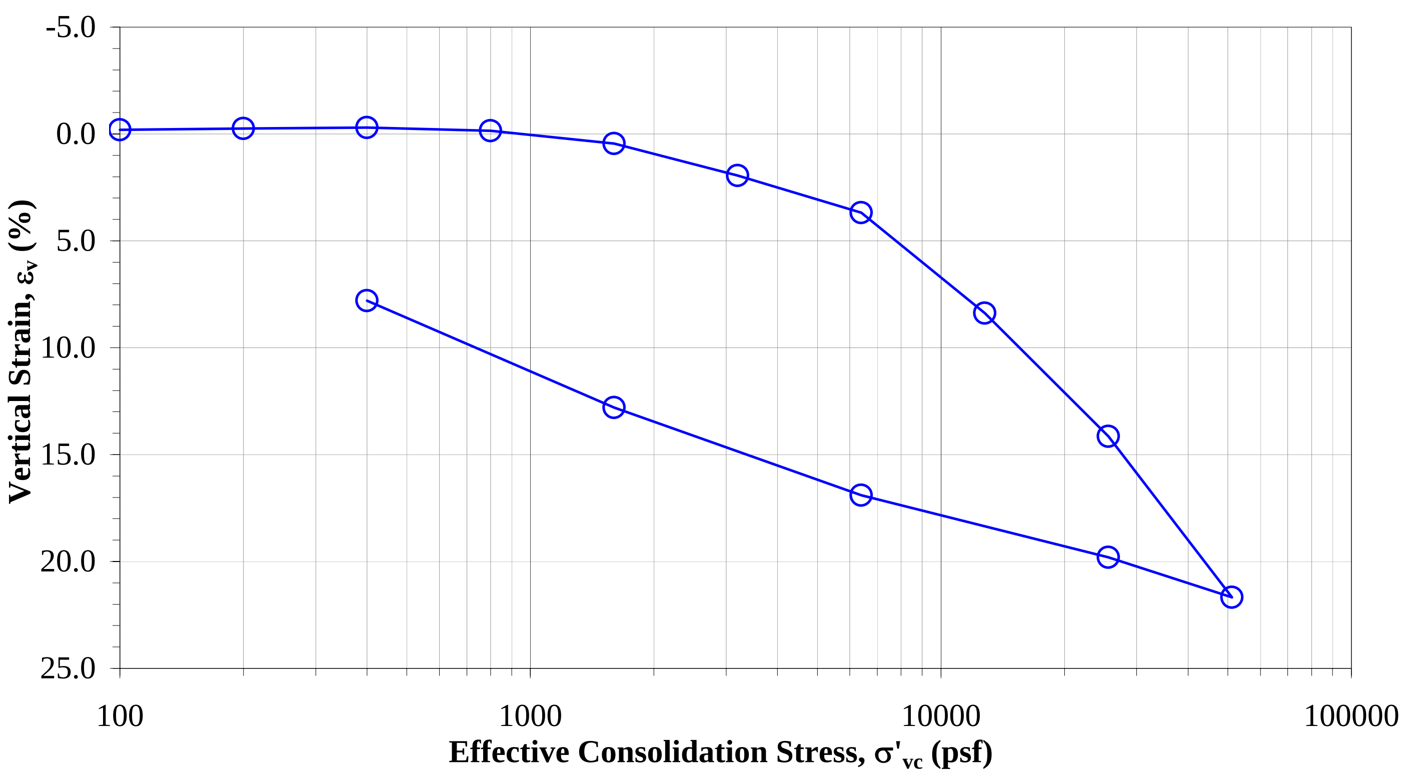
Boring No.: **B-07**
Sample:
Depth: **9.5'**
Sample Description: Brown clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from Shelby tube

Consolidometer No.:	2	
Test method:	A	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9220
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	181.24	183.90
Wt. rings/tare (g)	43.18	43.18
Moist unit wt., γ_m (pcf)	114.7	126.8
Wet soil + tare (g)	522.32	
Dry soil + tare (g)	420.89	
Tare (g)	128.43	
Water content, w (%)	34.7	37.3
Dry unit wt., γ_d (pcf)	85.2	92.4
Saturation	0.97	1.00

*Note: c_v, c_c, c_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0509	0.00	1.0000	0.957
100	0.0490	-0.19	1.0019	0.960
200	0.0483	-0.26	1.0026	0.962
400	0.0479	-0.30	1.0030	0.963
800	0.0494	-0.15	1.0015	0.960
1600	0.0554	0.45	0.9955	0.948
3200	0.0704	1.95	0.9805	0.919
6400	0.0877	3.68	0.9632	0.885
12800	0.1348	8.39	0.9161	0.793
25600	0.1923	14.14	0.8586	0.680
51200	0.2676	21.67	0.7833	0.533
25600	0.2490	19.81	0.8019	0.569
6400	0.2199	16.90	0.8310	0.626
1600	0.1789	12.80	0.8720	0.706
400	0.1289	7.80	0.9220	0.804



Comments: Specimen swelled upon inundation, and at 100, 200, 400 and 800 psf loadings.

Entered: ________
Reviewed: ________

One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah
Date: 3/5/2013
By: MP

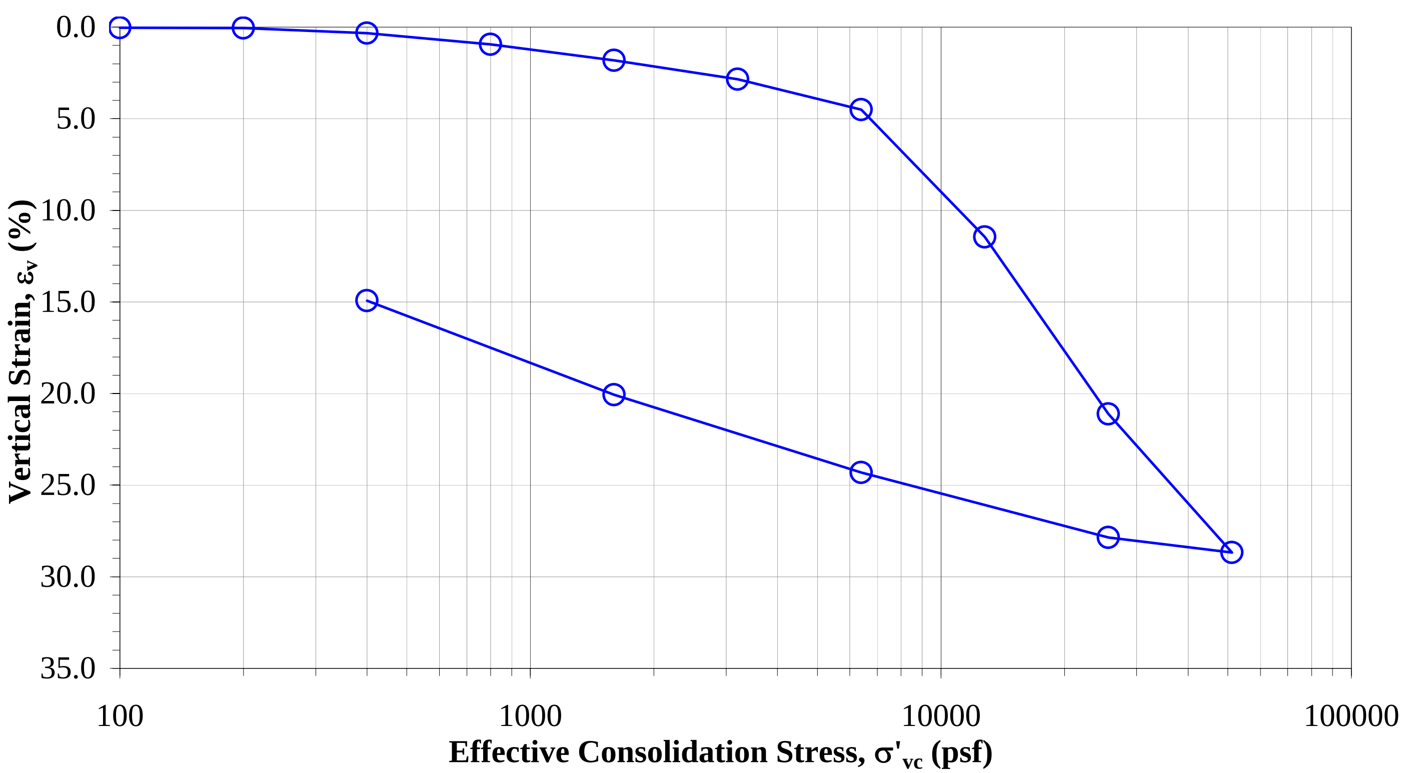
Boring No.: **B-08**
Sample:
Depth: **14.5'**
Sample Description: Grey clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Consolidometer No.:	3	
Test method:	A	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.8506
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	176.20	167.28
Wt. rings/tare (g)	46.53	46.53
Moist unit wt., γ_m (pcf)	107.8	118.0
Wet soil + tare (g)	382.58	
Dry soil + tare (g)	296.03	
Tare (g)	127.34	
Water content, w (%)	51.3	40.9
Dry unit wt., γ_d (pcf)	71.2	83.7
Saturation	1.00	1.00

*Note: c_v, c_c, c_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0555	0.00	1.0000	1.341
100	0.0558	0.03	0.9997	1.340
200	0.0561	0.06	0.9994	1.339
400	0.0589	0.34	0.9966	1.333
800	0.0649	0.94	0.9906	1.319
1600	0.0736	1.81	0.9819	1.298
3200	0.0839	2.84	0.9716	1.274
6400	0.1005	4.50	0.9550	1.235
12800	0.1701	11.46	0.8854	1.072
25600	0.2667	21.12	0.7888	0.846
51200	0.3423	28.68	0.7132	0.669
25600	0.3341	27.86	0.7214	0.688
6400	0.2986	24.31	0.7569	0.772
1600	0.2562	20.07	0.7993	0.871
400	0.2049	14.94	0.8506	0.991



Comments: Specimen swelled upon inundation and at 100 psf loading.

Entered: ________
Reviewed: ________

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One-Dimensional Consolidation Properties of Soils

(*ASTM D2435*)

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Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/26/2013
By: MP

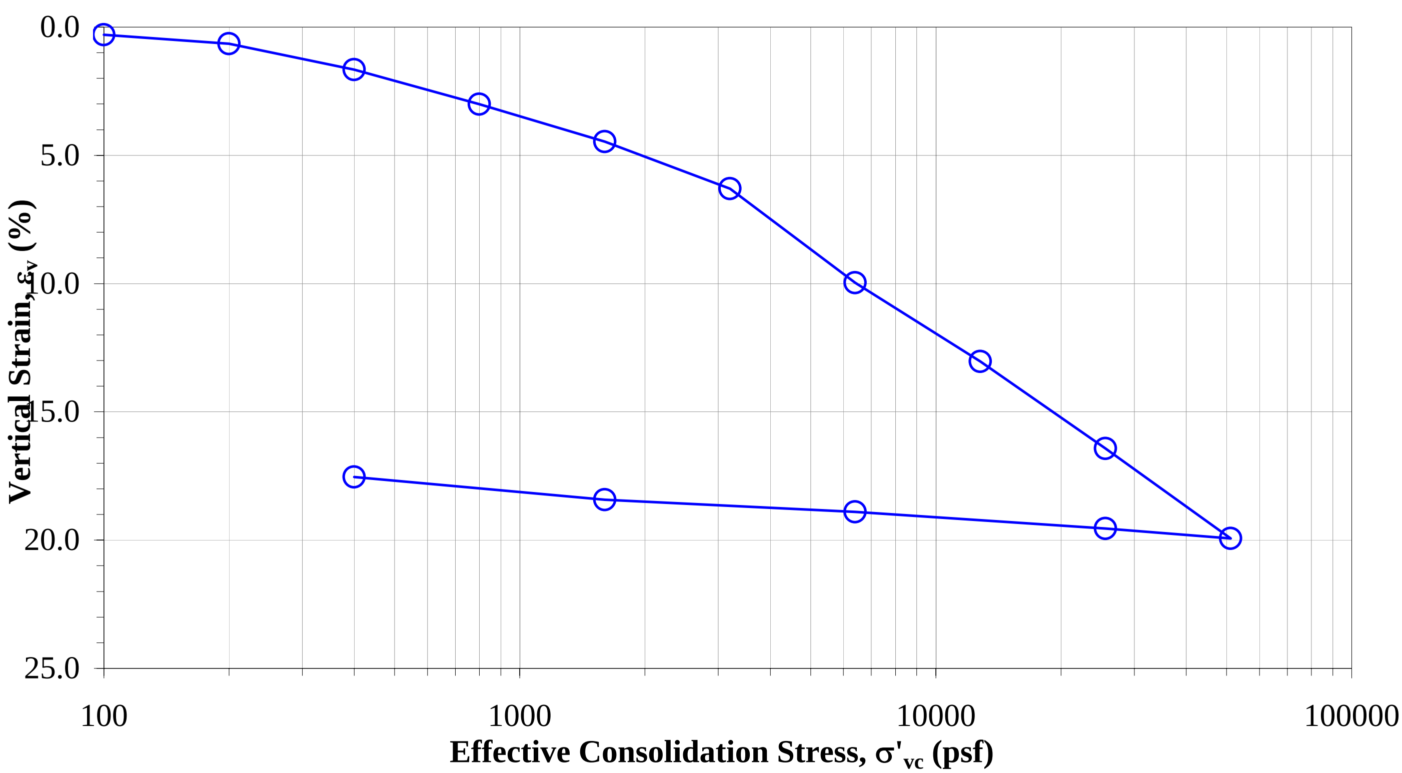
Boring No.: B-09
Sample:
Depth: 24.5'
Sample Description: Grey clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Consolidometer No.:	4	
Test method:	A	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.8246
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	176.86	167.42
Wt. rings/tare (g)	41.52	41.52
Moist unit wt., γ_m (pcf)	112.5	126.9
Wet soil + tare (g)	391.00	
Dry soil + tare (g)	316.99	
Tare (g)	127.57	
Water content, w (%)	39.1	29.4
Dry unit wt., γ_d (pcf)	80.9	98.1
Saturation	0.98	1.00

*Note: c_v, c_c, c_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0025	0.00	1.0000	1.061
100	0.0055	0.30	0.9970	1.055
200	0.0090	0.65	0.9935	1.048
400	0.0191	1.66	0.9834	1.027
800	0.0326	3.01	0.9699	0.999
1600	0.0472	4.47	0.9553	0.969
3200	0.0655	6.30	0.9370	0.931
6400	0.1022	9.97	0.9003	0.856
12800	0.1329	13.04	0.8696	0.792
25600	0.1668	16.43	0.8357	0.723
51200	0.2018	19.93	0.8007	0.650
25600	0.1980	19.55	0.8045	0.658
6400	0.1915	18.90	0.8110	0.672
1600	0.1867	18.42	0.8158	0.681
400	0.1779	17.54	0.8246	0.700



Entered: _________
Reviewed: _________

One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah
Date: 2/26/2013
By: MP

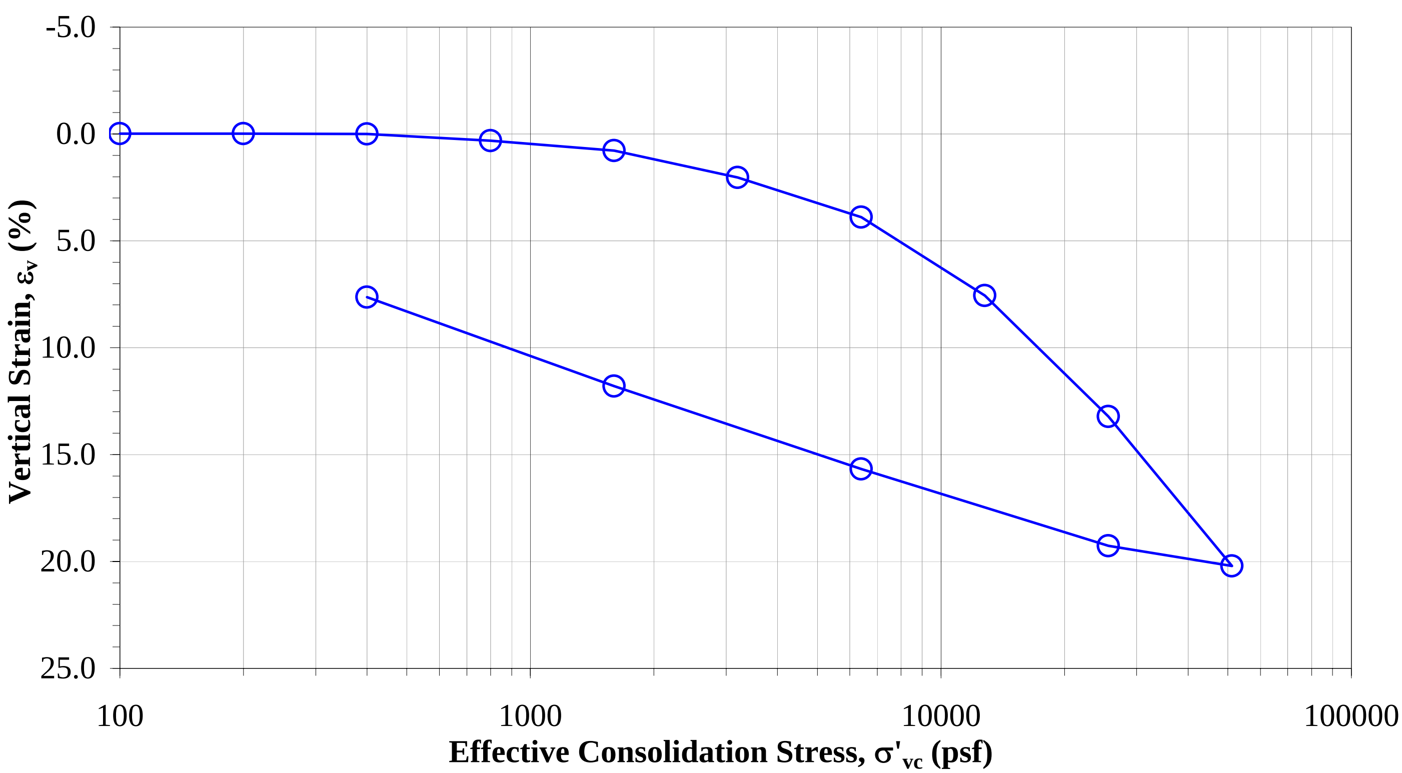
Boring No.: **B-12**
Sample:
Depth: **14.5'**
Sample Description: Grey clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Consolidometer No.:	5	
Test method:	A	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9237
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	179.50	174.65
Wt. rings/tare (g)	43.26	43.26
Moist unit wt., γ_m (pcf)	113.2	118.2
Wet soil + tare (g)	391.50	
Dry soil + tare (g)	316.26	
Tare (g)	122.46	
Water content, w (%)	38.8	33.9
Dry unit wt., γ_d (pcf)	81.6	88.3
Saturation	0.99	1.00

*Note: c_v, c_c, c_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0230	0.00	1.0000	1.044
100	0.0229	-0.01	1.0001	1.044
200	0.0229	-0.01	1.0001	1.044
400	0.0230	0.00	1.0000	1.044
800	0.0261	0.31	0.9969	1.038
1600	0.0308	0.78	0.9922	1.028
3200	0.0434	2.04	0.9796	1.002
6400	0.0619	3.89	0.9611	0.964
12800	0.0986	7.56	0.9244	0.889
25600	0.1552	13.22	0.8678	0.774
51200	0.2251	20.21	0.7979	0.631
25600	0.2156	19.26	0.8074	0.650
6400	0.1797	15.67	0.8433	0.724
1600	0.1410	11.80	0.8820	0.803
400	0.0993	7.63	0.9237	0.888



Comments: Specimen swelled upon inundation, and at 100, 200 and 400 psf loadings.

Entered: ________
Reviewed: ________

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One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

IGES

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/19/2013
By: MP

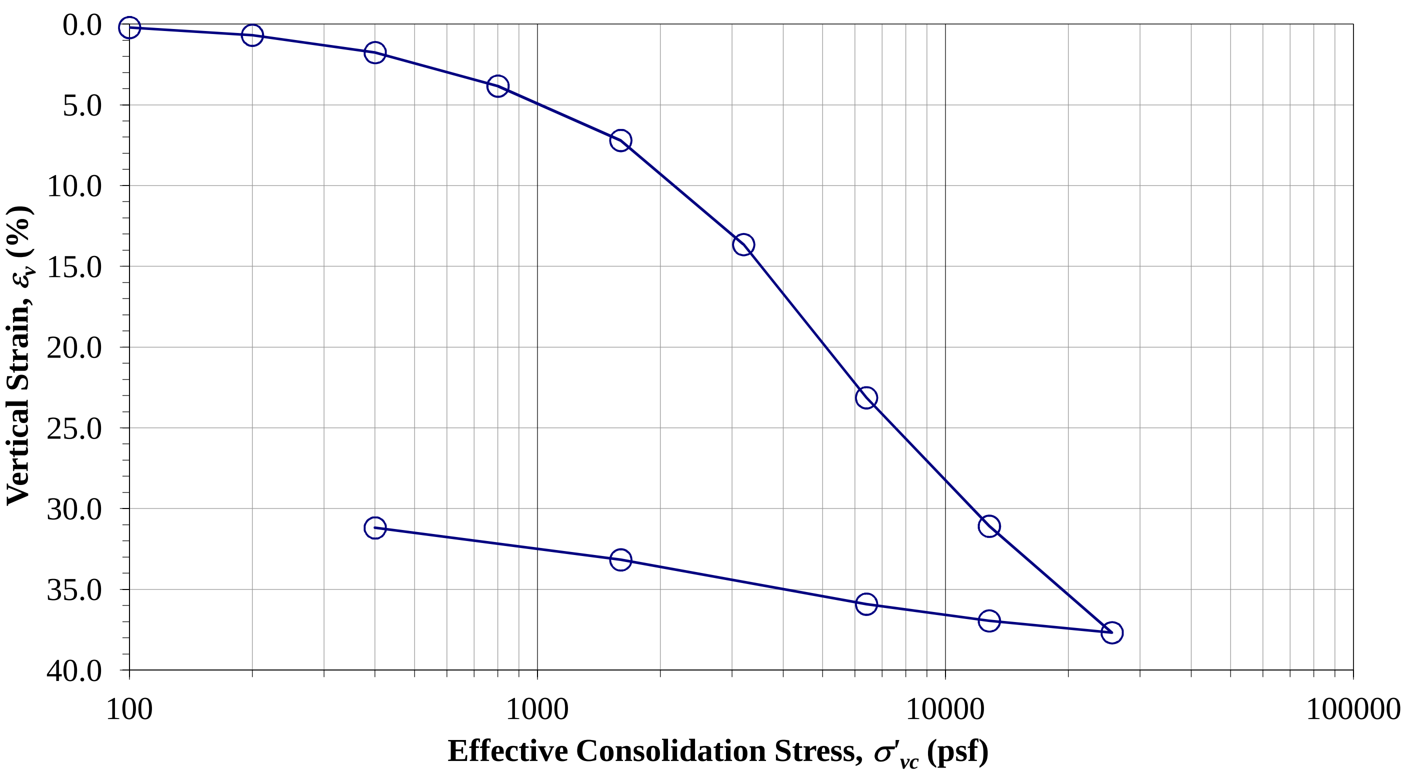
Boring No.: B-02
Sample:
Depth: 24.5'
Sample Description: Grey clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Test method:	B	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.6881
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	161.88	139.84
Wt. rings/tare (g)	42.61	42.61
Total unit wt., γ (pcf)	99.1	117.4
Wet soil + tare (g)	355.98	
Dry soil + tare (g)	259.05	
Tare (g)	124.43	
Water content, ω (%)	72.0	40.2
Dry unit wt., γ_d (pcf)	57.6	83.7
Saturation, S	1.00	1.00

*Note: C_v, C_c, C_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0000	0.00	1.0000	1.8927
100	0.0021	0.21	0.9979	1.8867
200	0.0068	0.68	0.9932	1.8729
400	0.0176	1.76	0.9824	1.8417
800	0.0383	3.83	0.9617	1.7818
1600	0.0720	7.20	0.9280	1.6844
3200	0.1365	13.65	0.8635	1.4978
6400	0.2313	23.13	0.7687	1.2236
12800	0.3109	31.09	0.6891	0.9933
25600	0.3768	37.68	0.6232	0.8027
12800	0.3695	36.95	0.6305	0.8238
6400	0.3591	35.91	0.6409	0.8539
1600	0.3317	33.17	0.6683	0.9332
400	0.3119	31.19	0.6881	0.9905



Entered: ________
Reviewed: ________

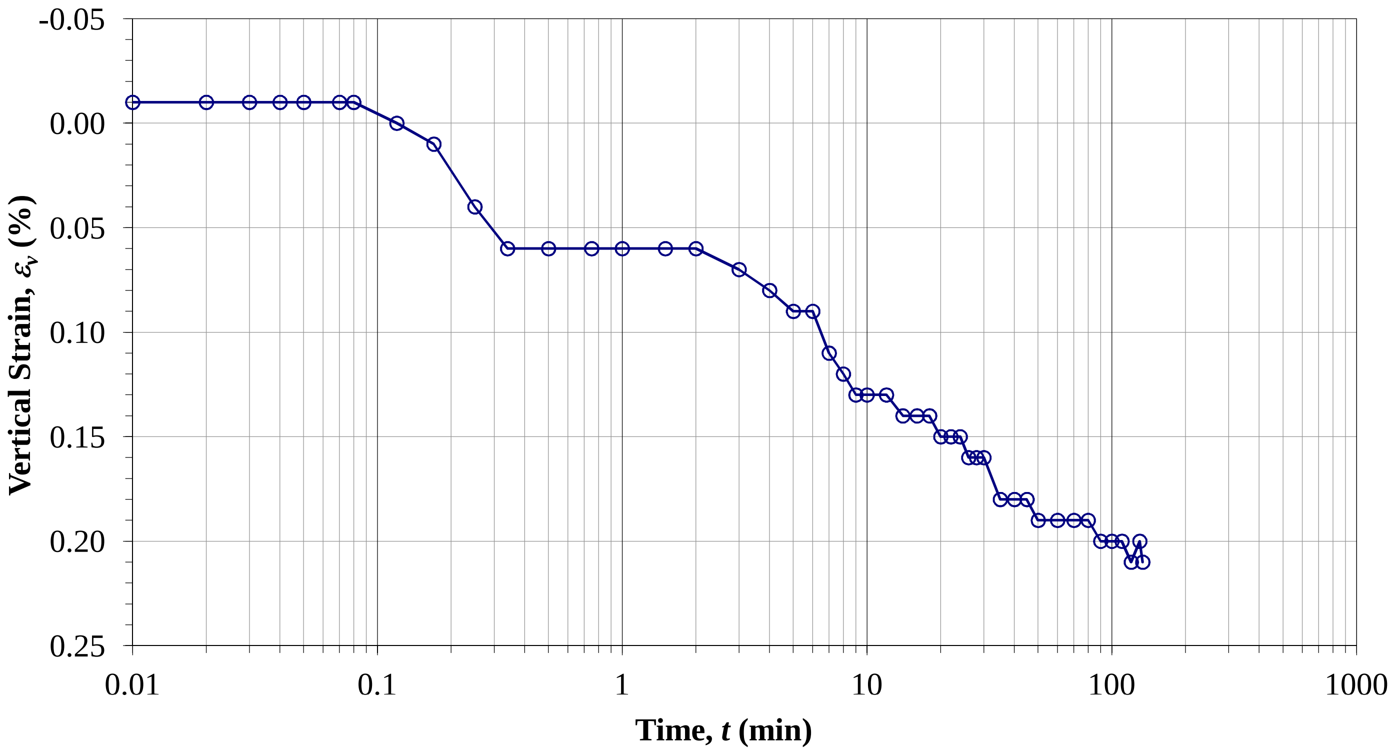
One-Dimensional Consolidation Properties of Soils

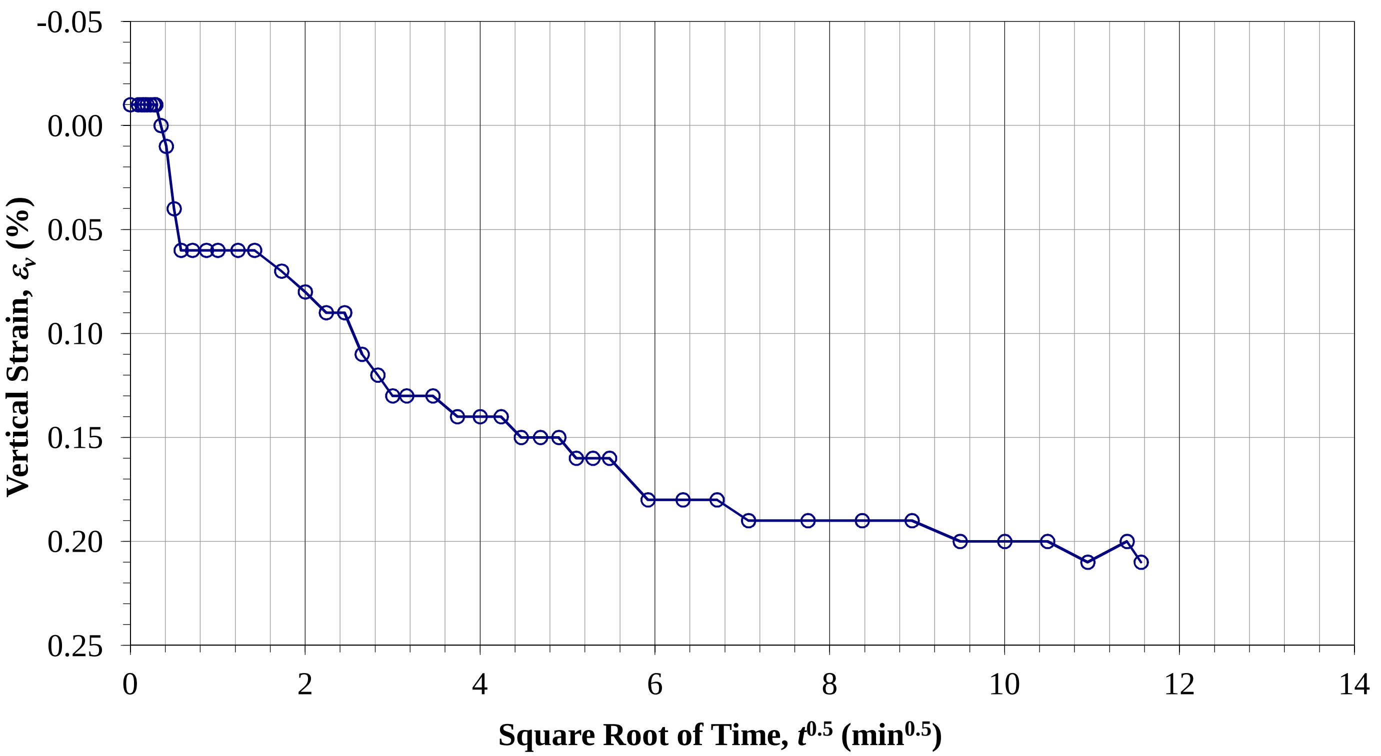
(ASTM D2435)

Project: Logan WWTP | **Boring No.:** B-02
No: 00823-012 | **Sample:**
Location: Logan, Utah | **Depth:** 24.5'

Constant Load Step: 1 of 13

Stress: 100 psf





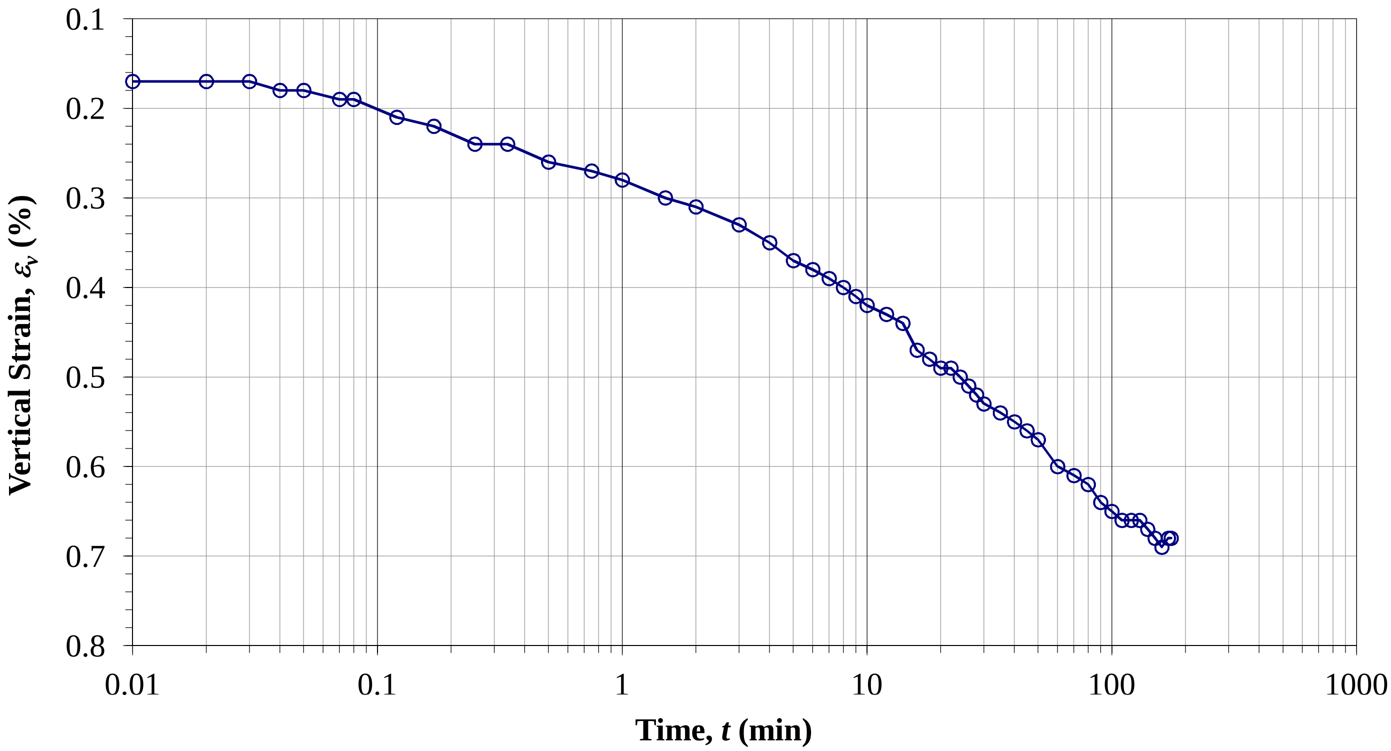
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

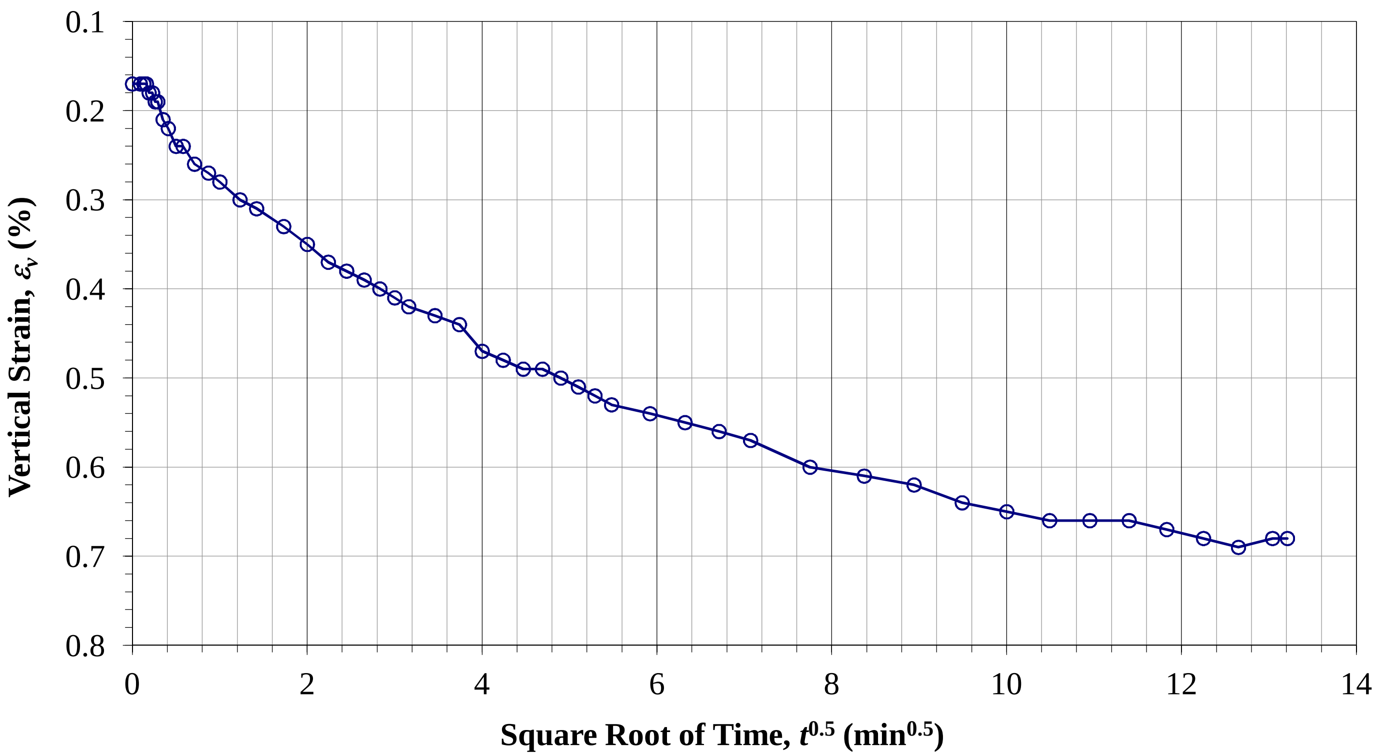
© IGES 2011, 2013

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-02
Sample:
Depth: 24.5'

Constant Load Step: 2 of 13
Stress: 200 psf





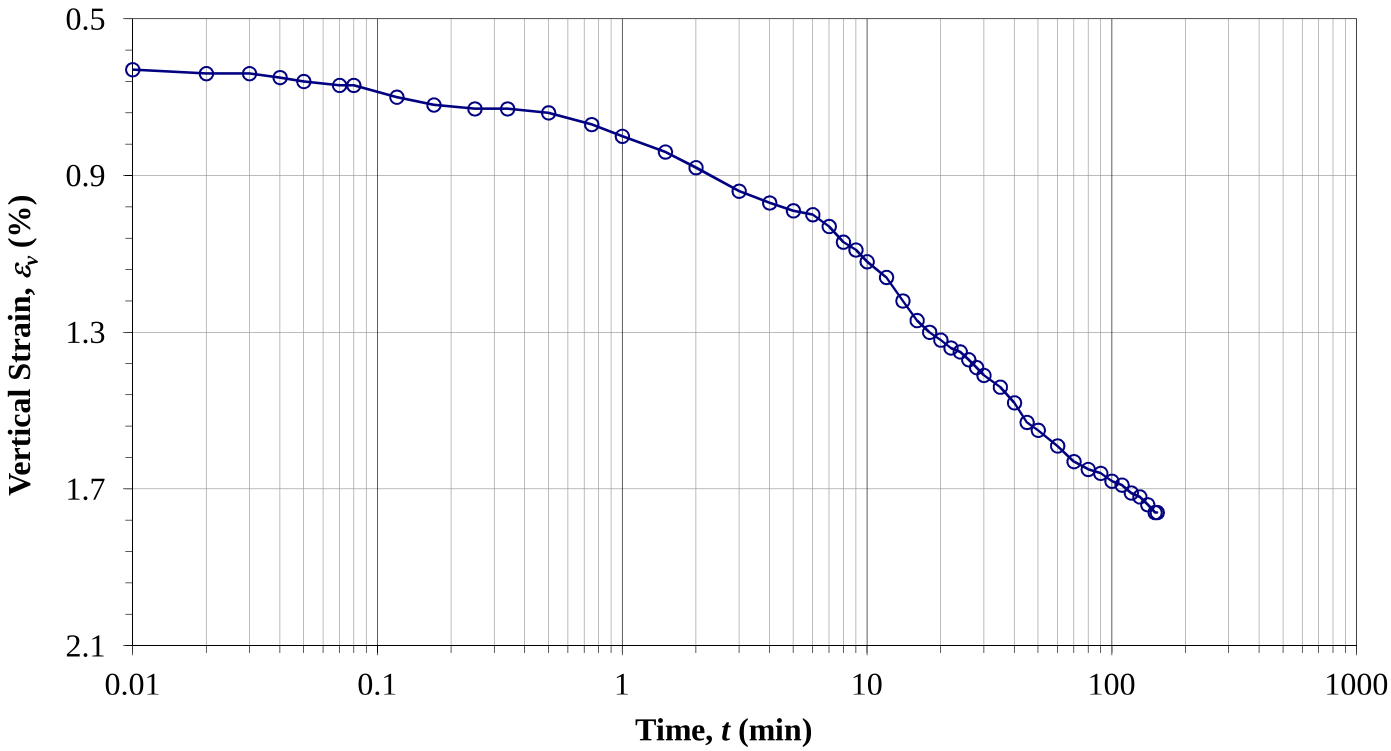
One-Dimensional Consolidation Properties of Soils

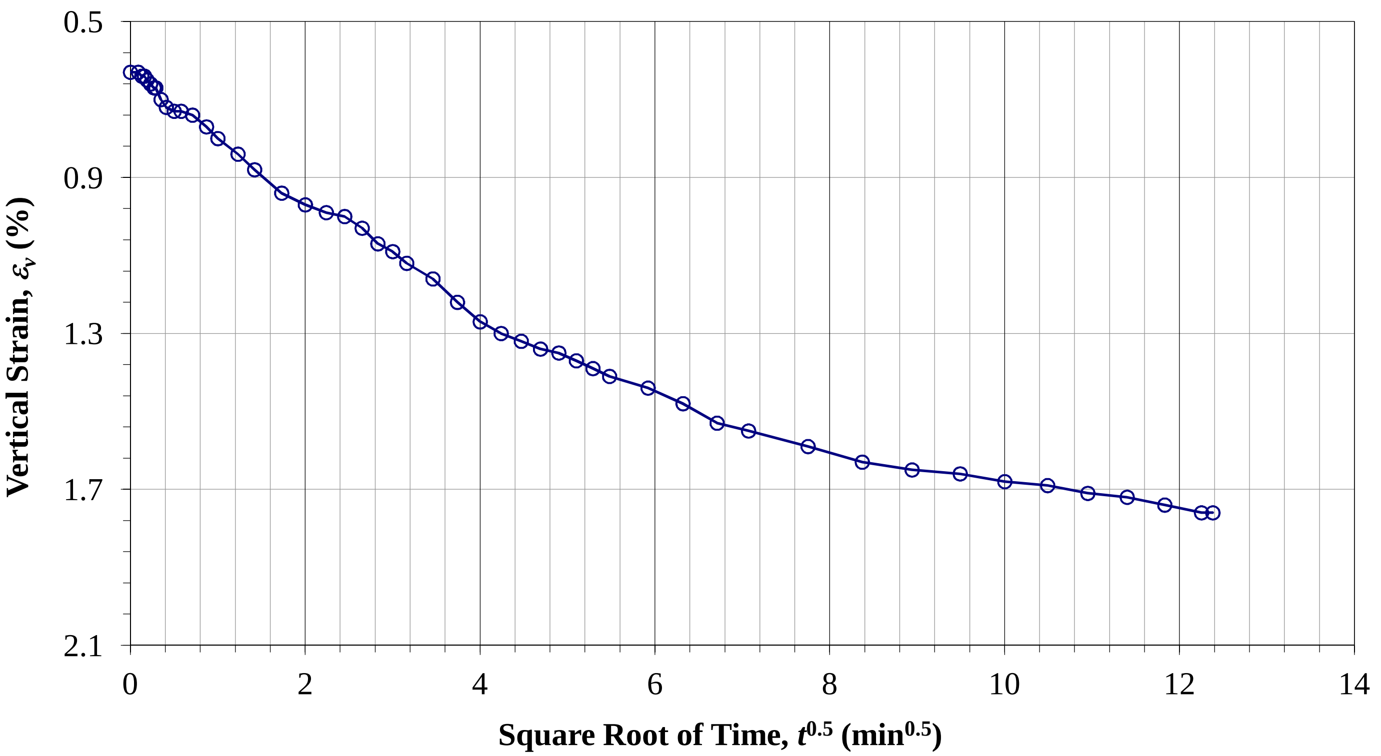
(ASTM D2435)

Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah

Boring No.: **B-02**
Sample:
Depth: **24.5'**

Constant Load Step: 3 of 13
Stress: 400 psf





One-Dimensional Consolidation Properties of Soils

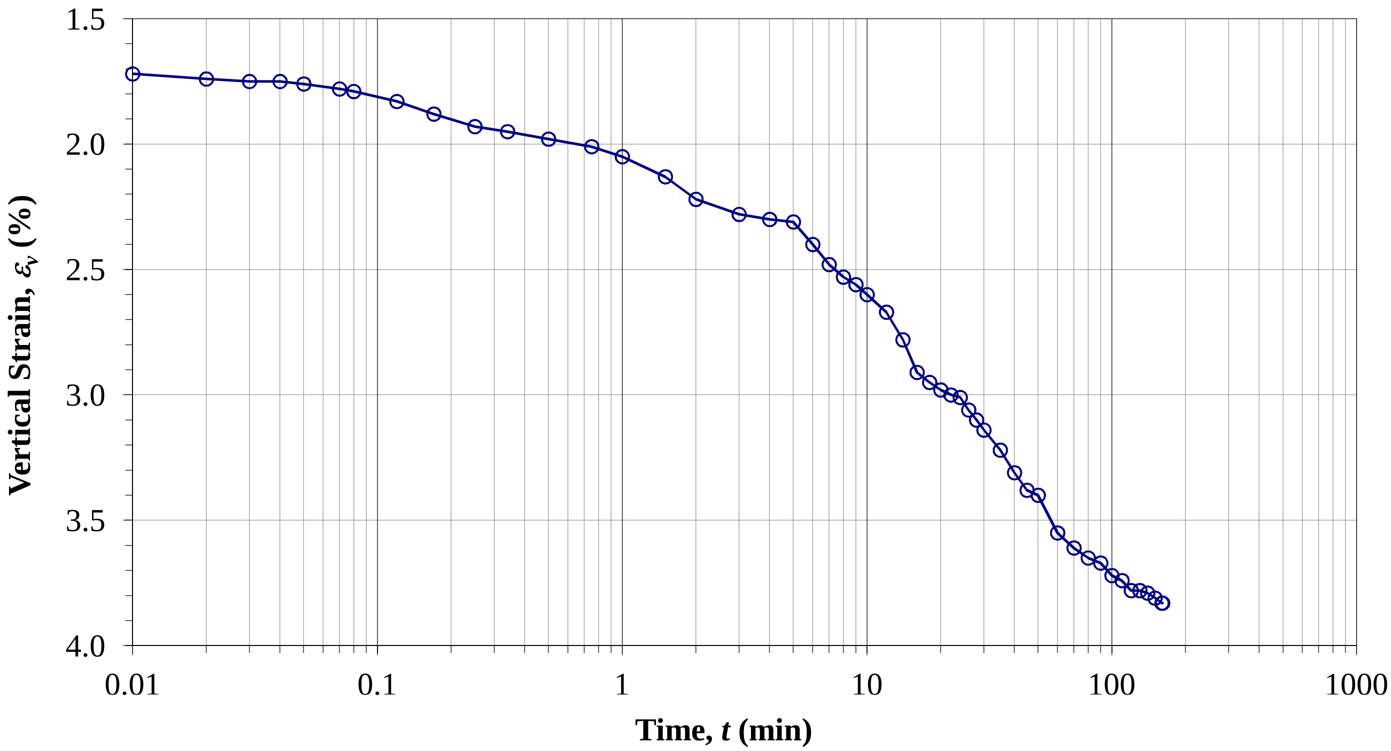
(ASTM D2435)

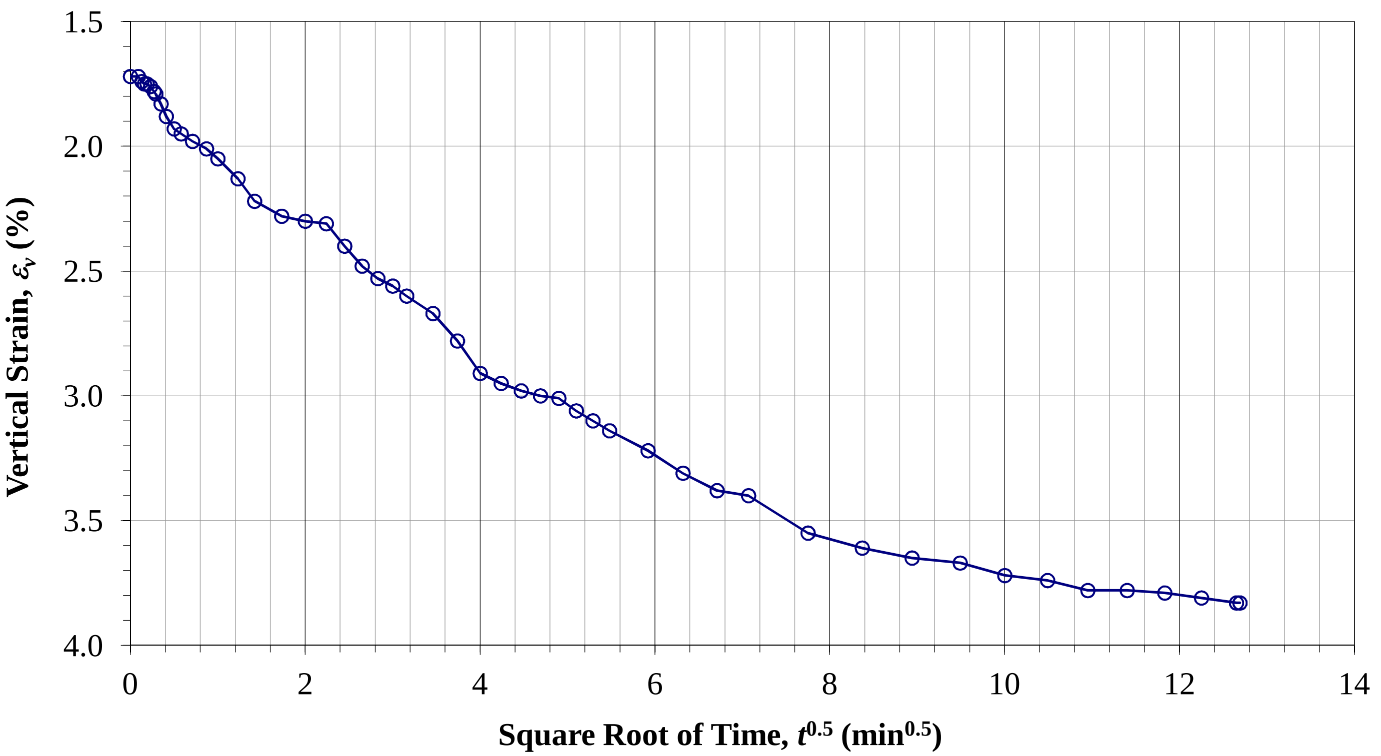
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-02
Sample:
Depth: 24.5'

Constant Load Step: 4 of 13

Stress: 800 psf





<u>**One-Dimensional Consolidation Properties of Soils**</u>

(ASTM D2435)

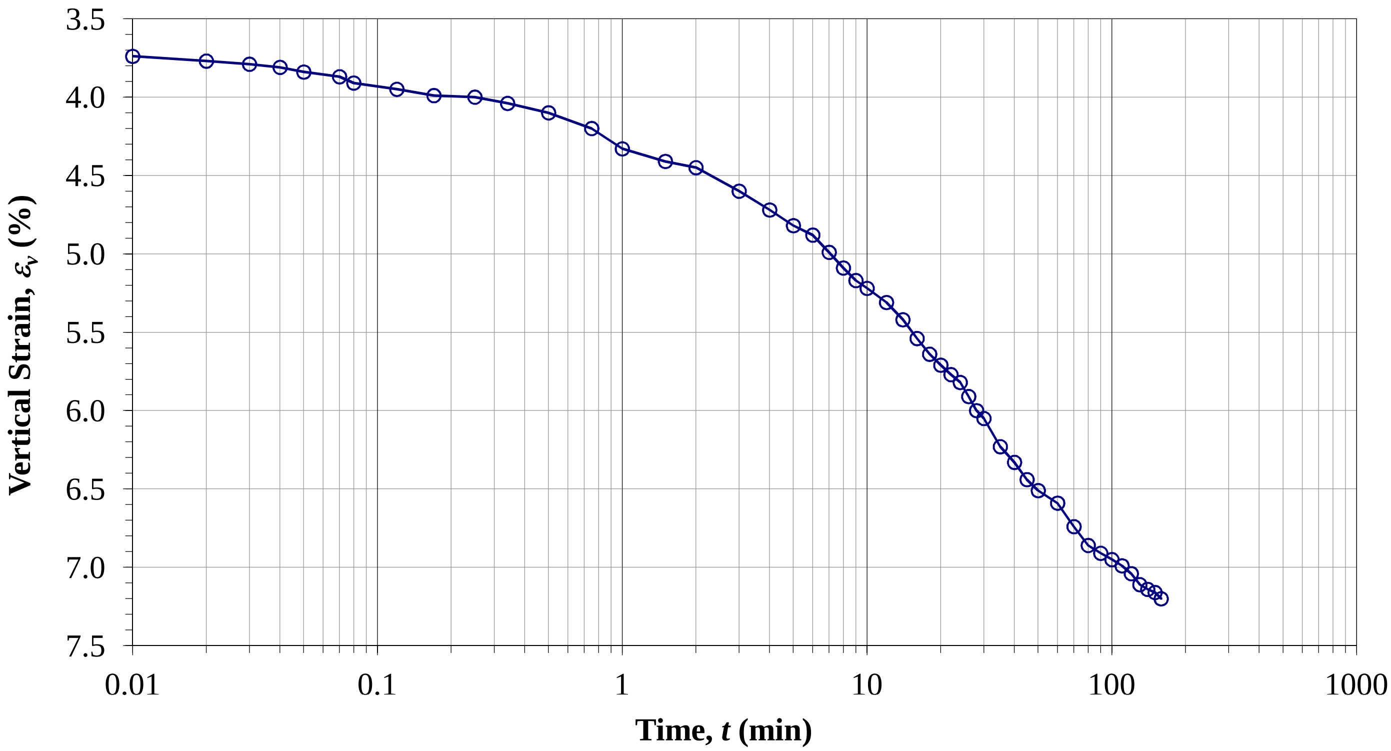
Project: **Logan WWTP** | **Boring No.:** **B-02**

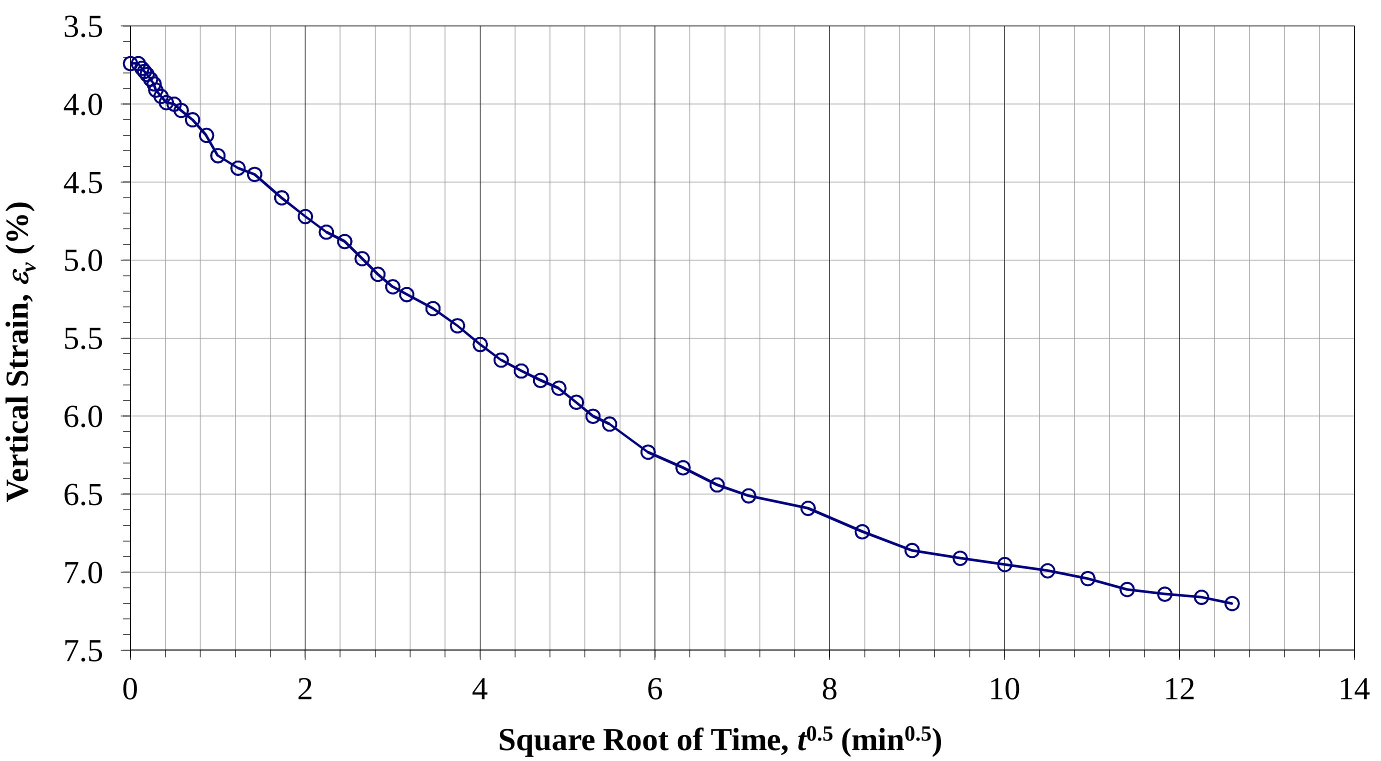
No: **00823-012** | **Sample:**

Location: Logan, Utah | **Depth:** **24.5'**

Constant Load Step: 5 of 13

Stress: 1600 psf



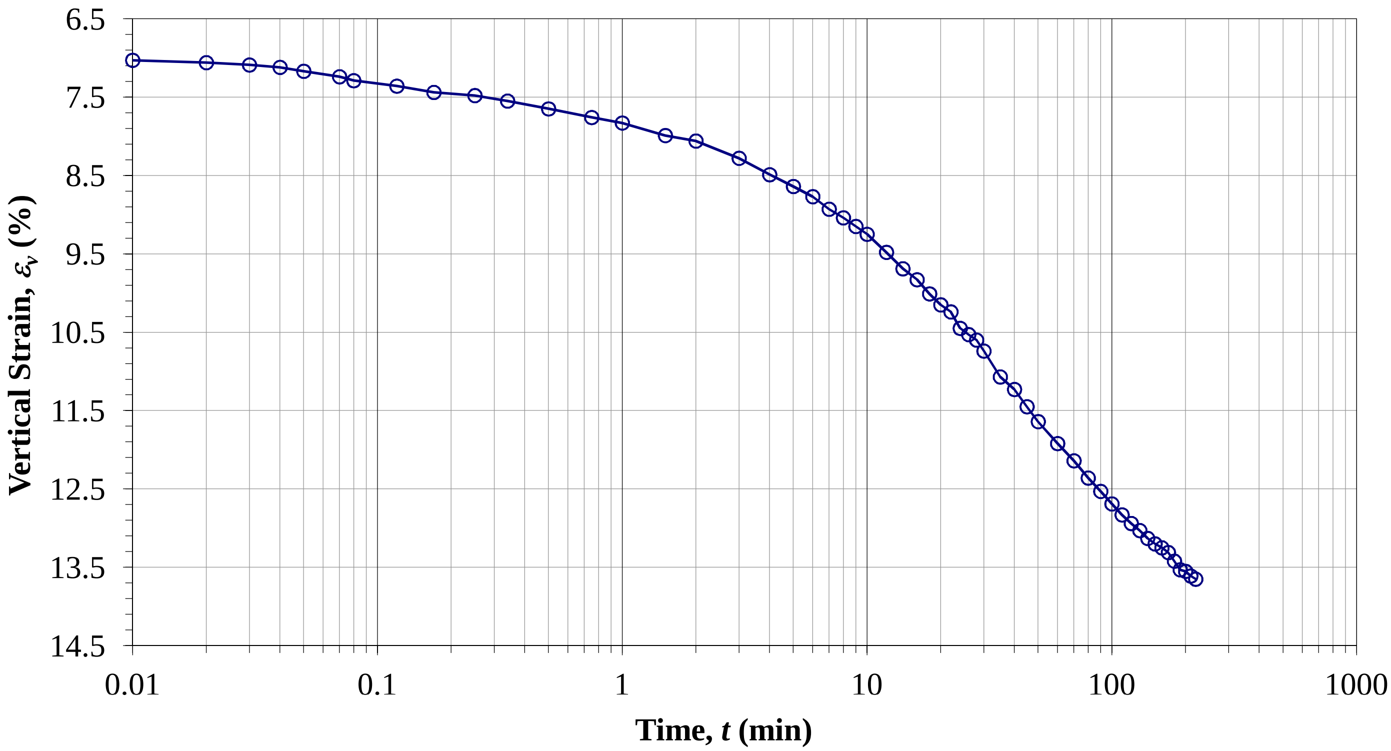


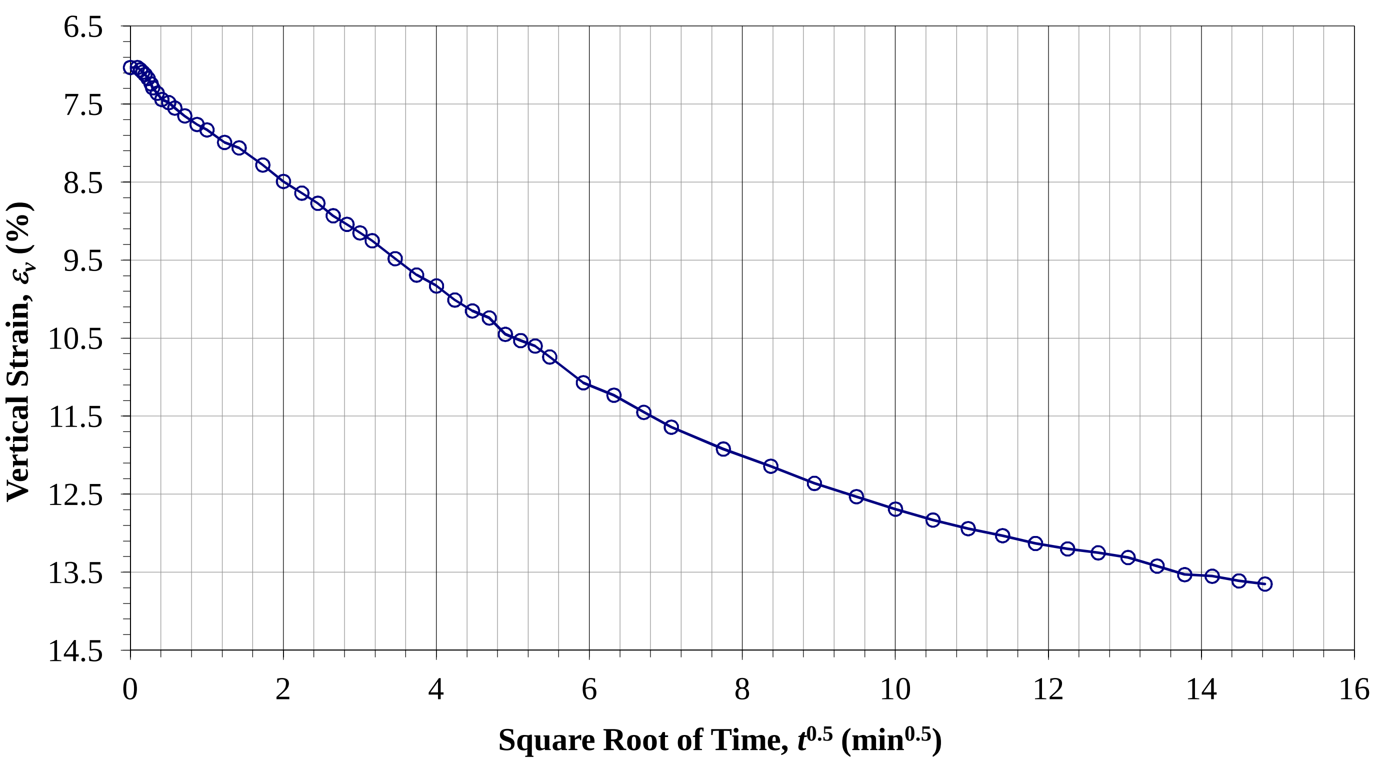
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-02
Sample:
Depth: 24.5'

Constant Load Step: 6 of 13
Stress: 3200 psf



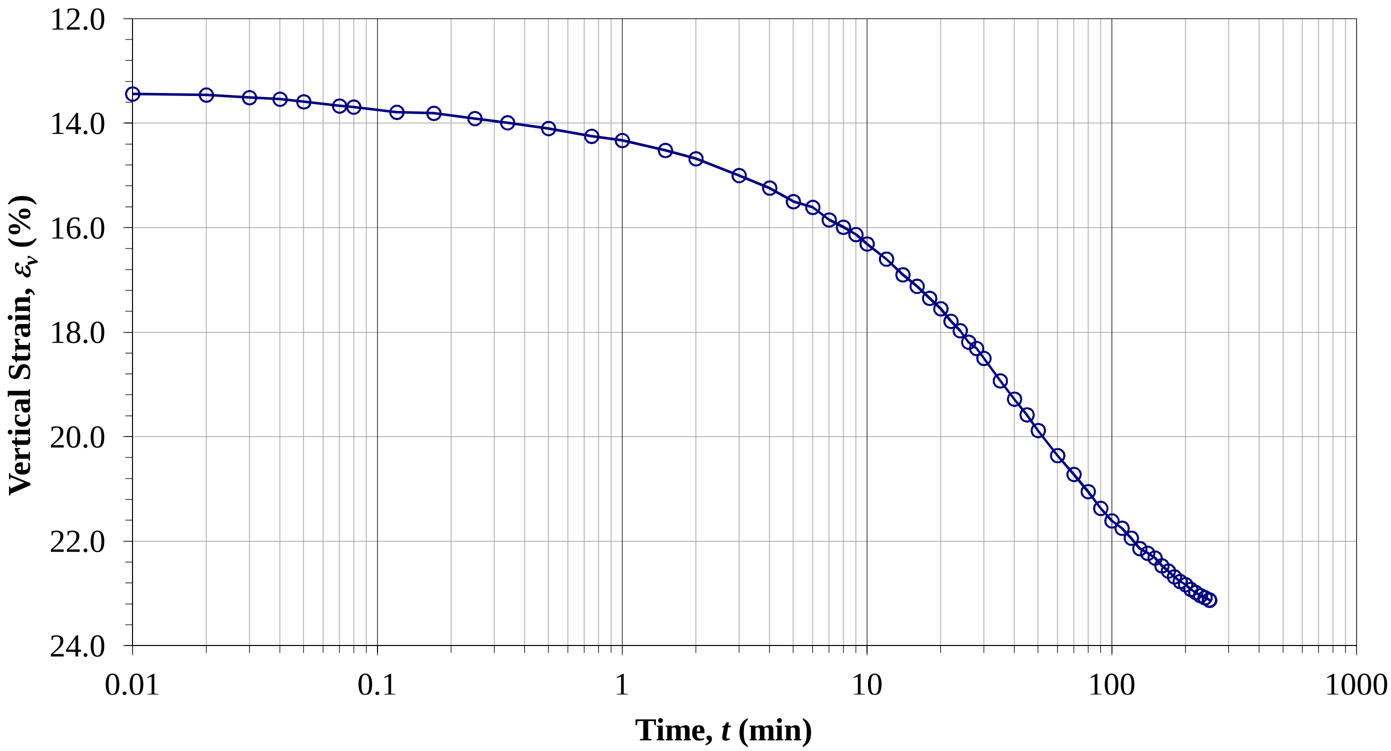


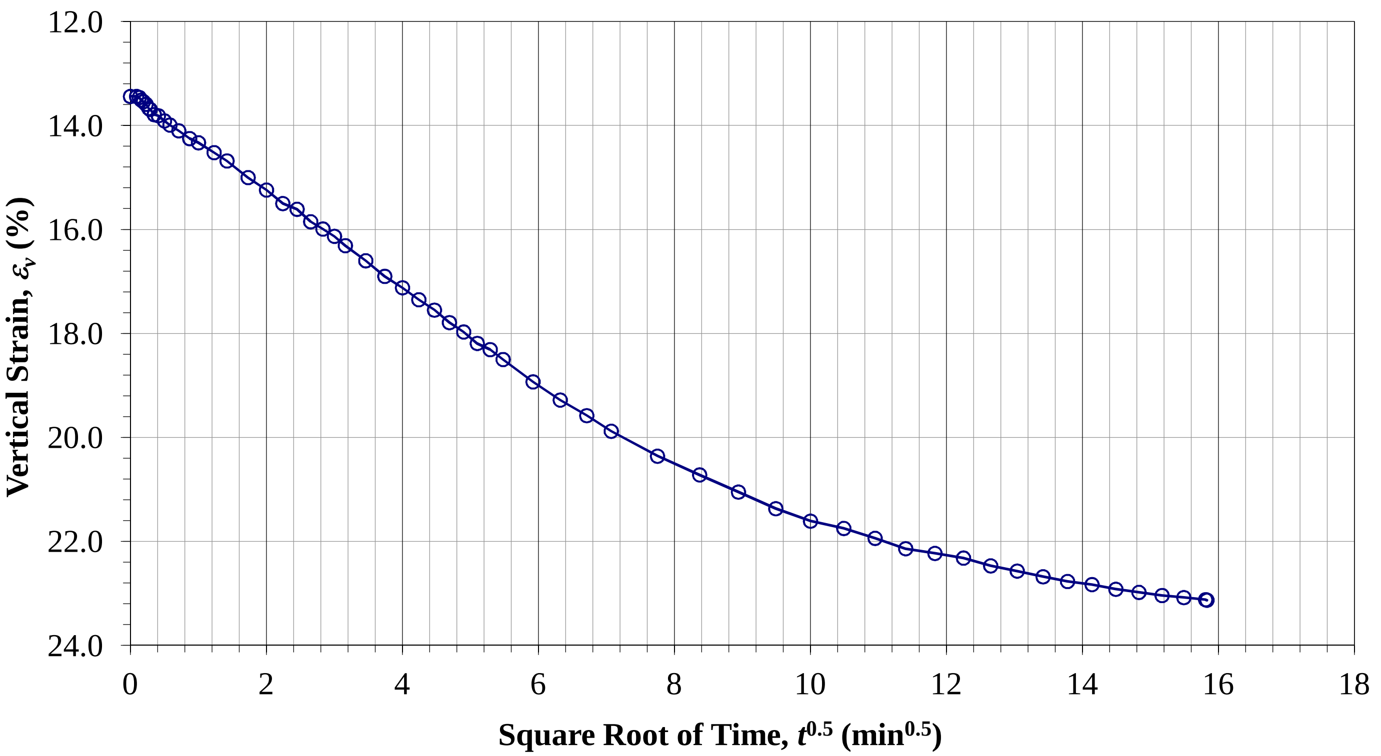
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-02
Sample:
Depth: 24.5'

Constant Load Step: 7 of 13
Stress: 6400 psf



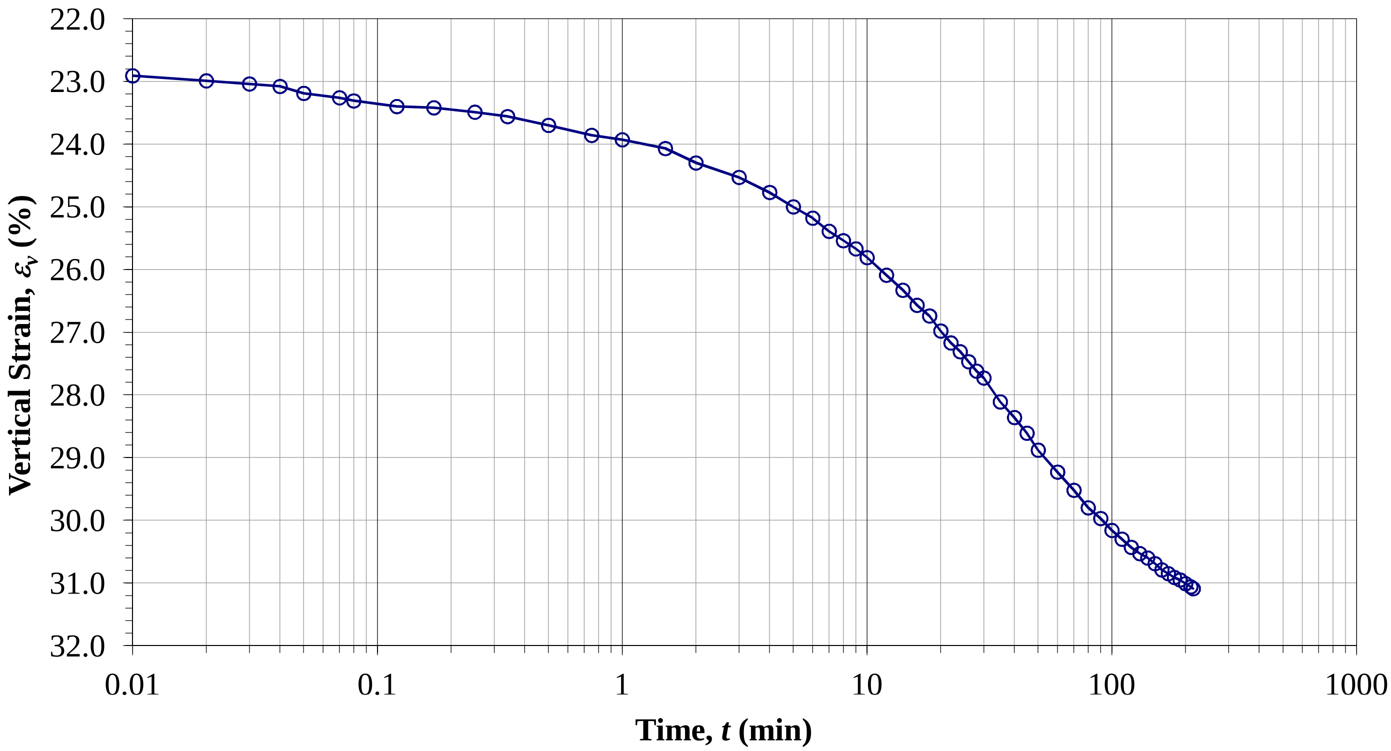


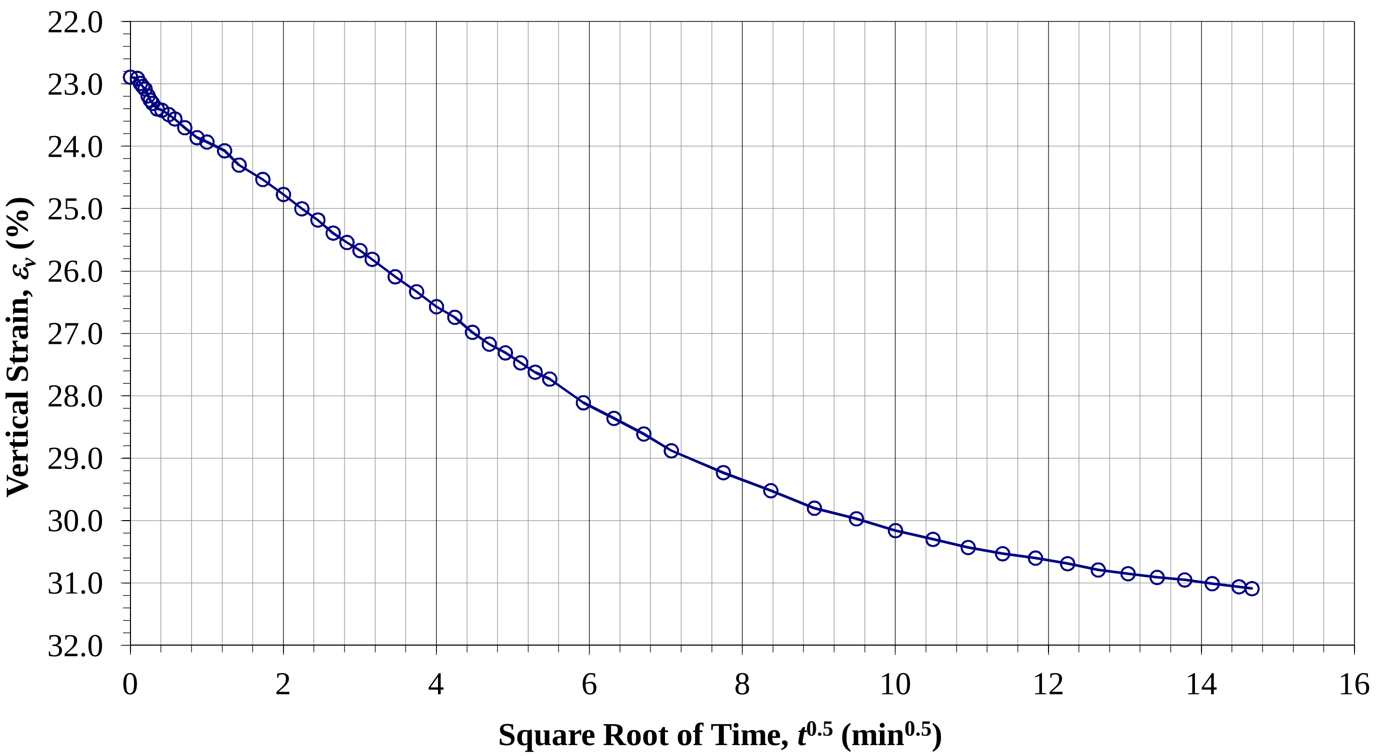
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-02
Sample:
Depth: 24.5'

Constant Load Step: 8 of 13
Stress: 12800 psf





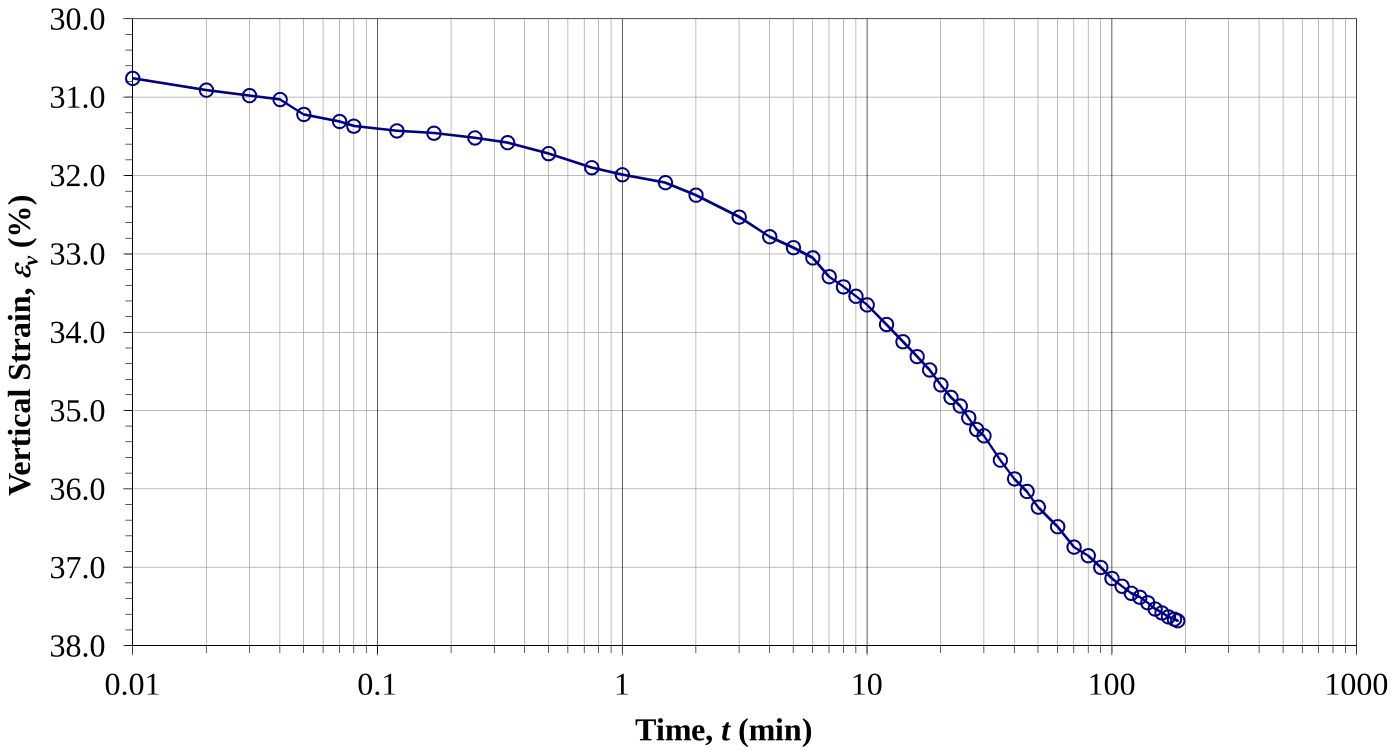
One-Dimensional Consolidation Properties of Soils

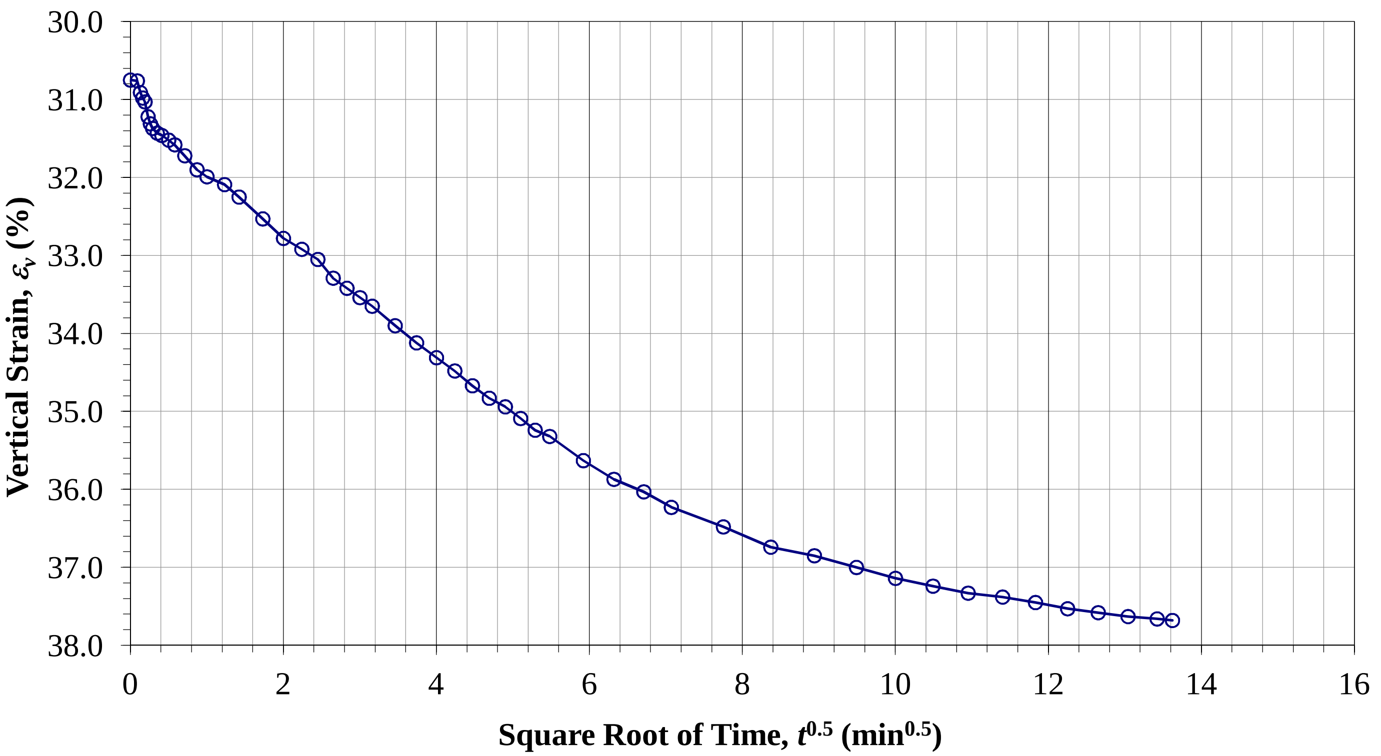
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-02
Sample:
Depth: 24.5'

Constant Load Step: 9 of 13
Stress: 25600 psf





One-Dimensional Consolidation Properties of Soils

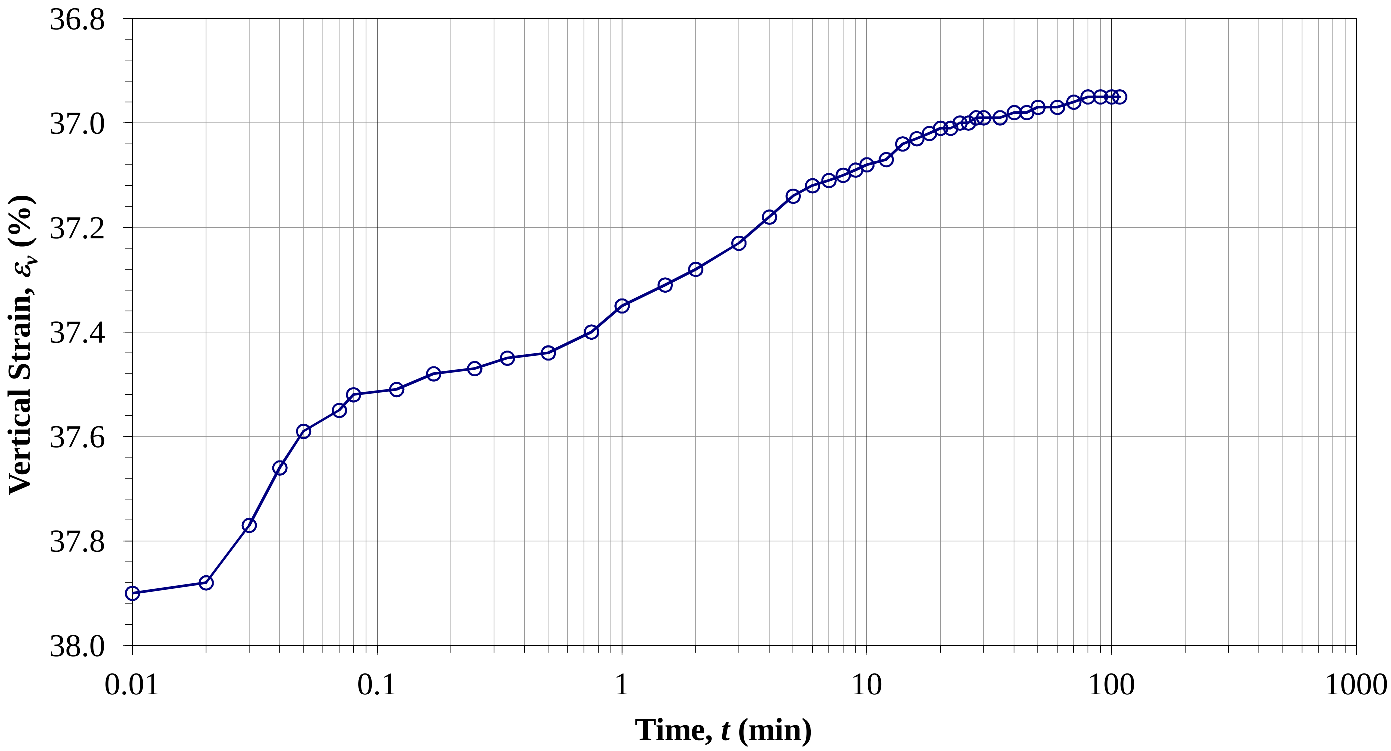
(ASTM D2435)

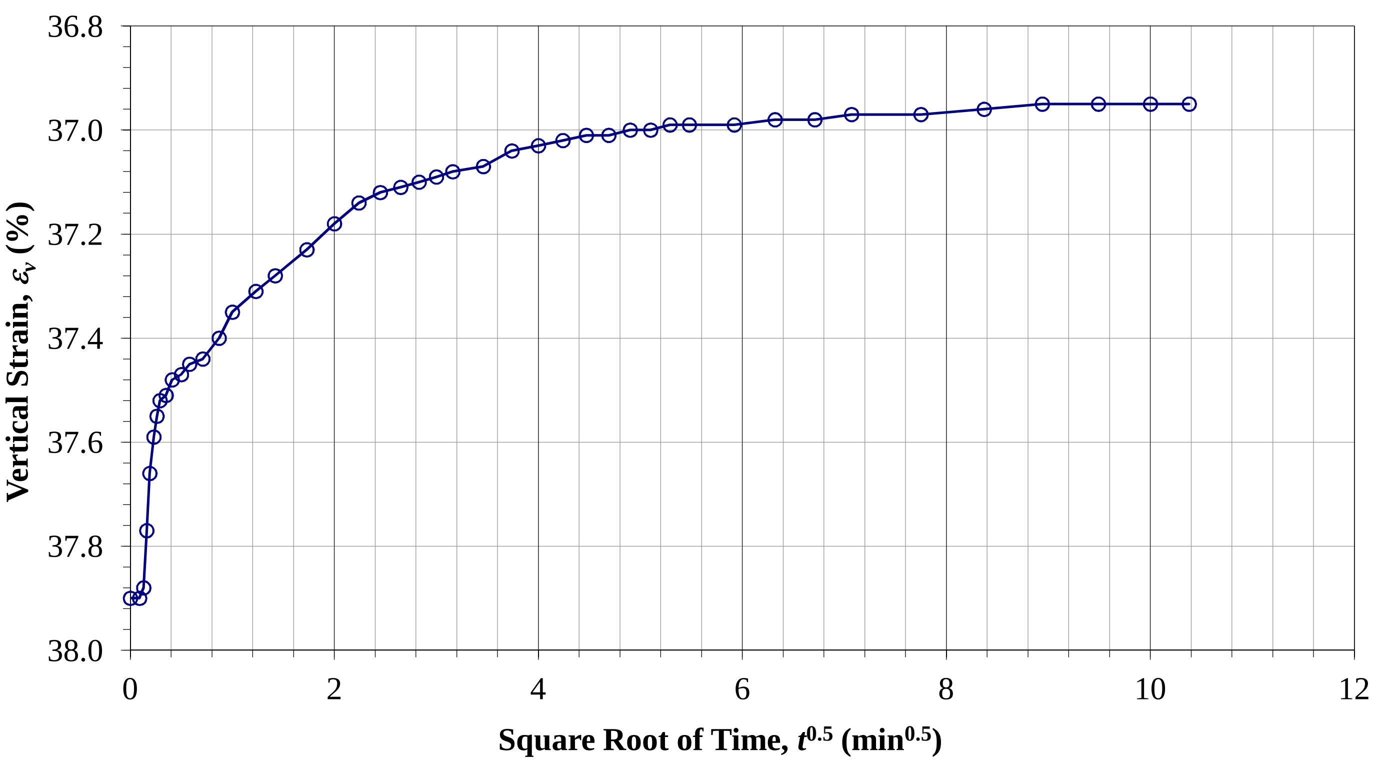
IGES

Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah

Boring No.: **B-02**
Sample:
Depth: **24.5'**

Constant Load Step: 10 of 13
Stress: 12800 psf





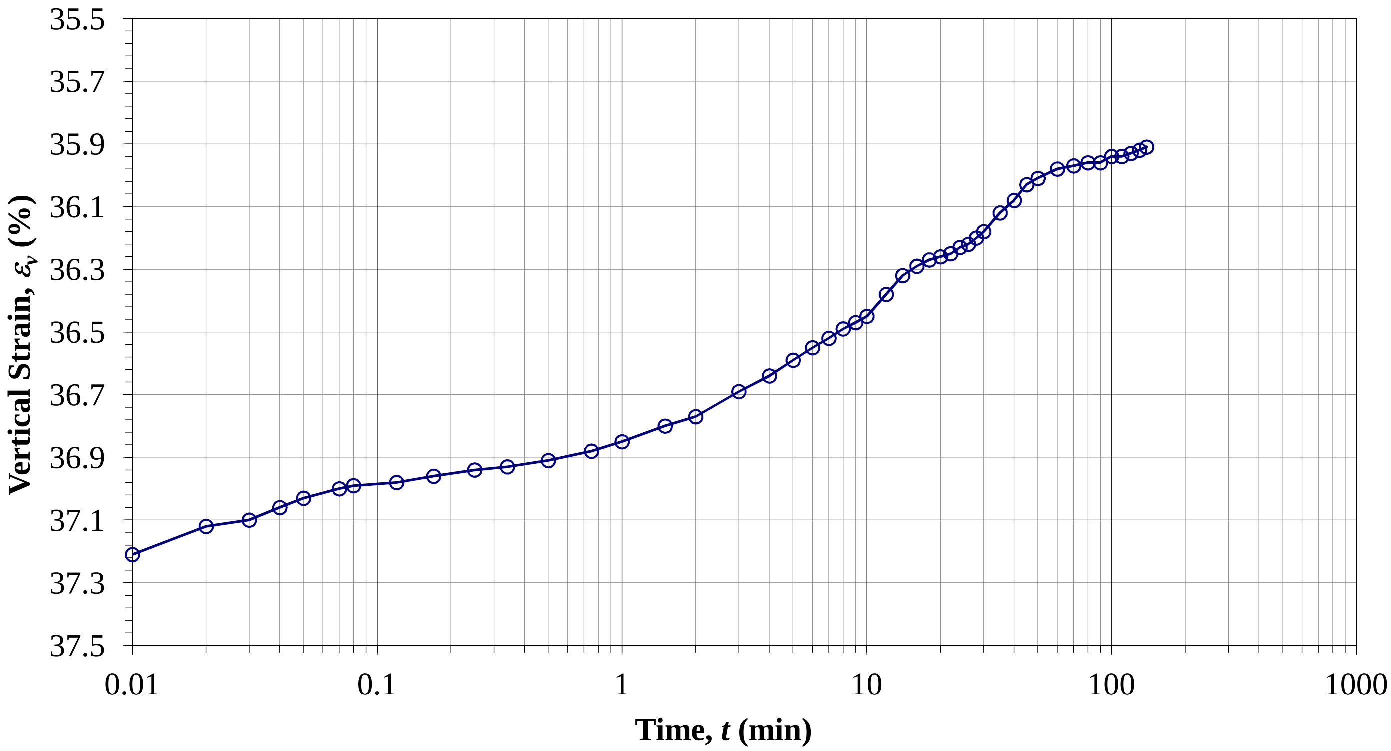
One-Dimensional Consolidation Properties of Soils

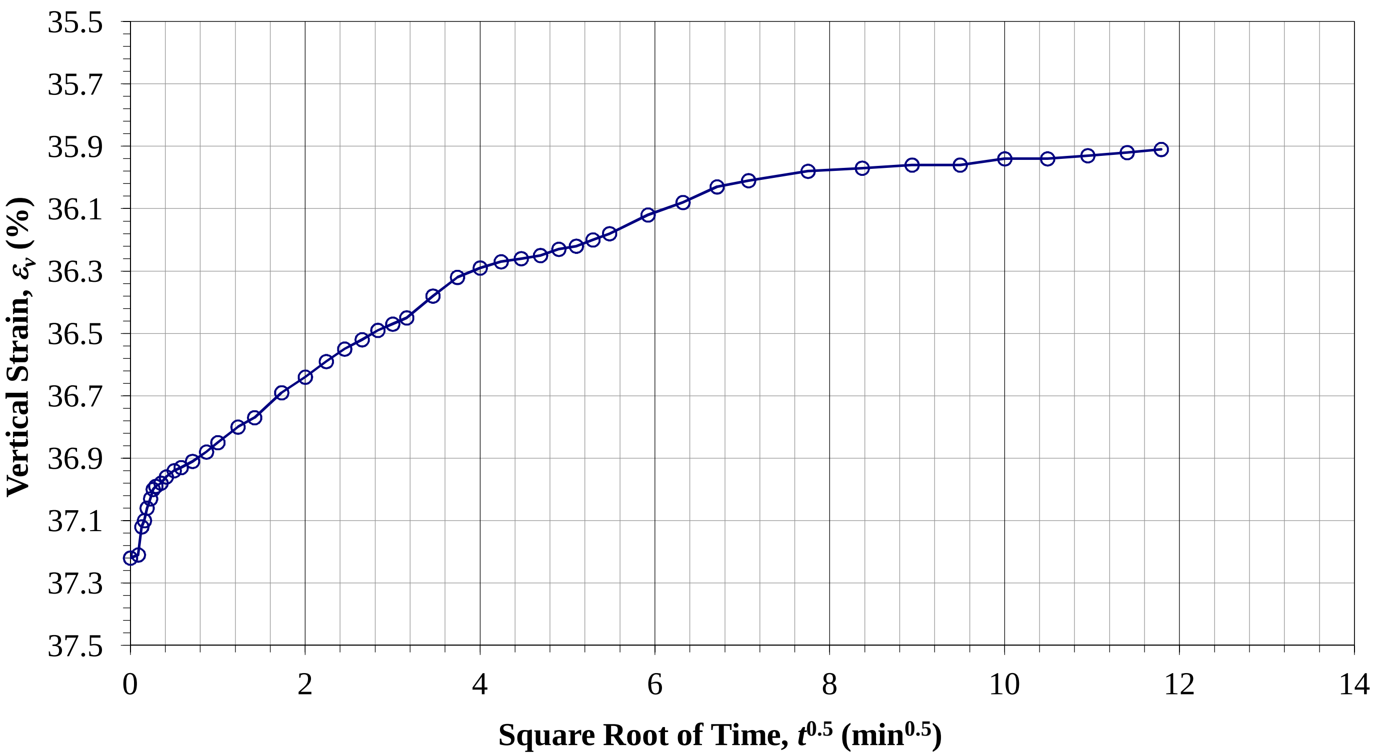
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-02
Sample:
Depth: 24.5'

Constant Load Step: 11 of 13
Stress: 6400 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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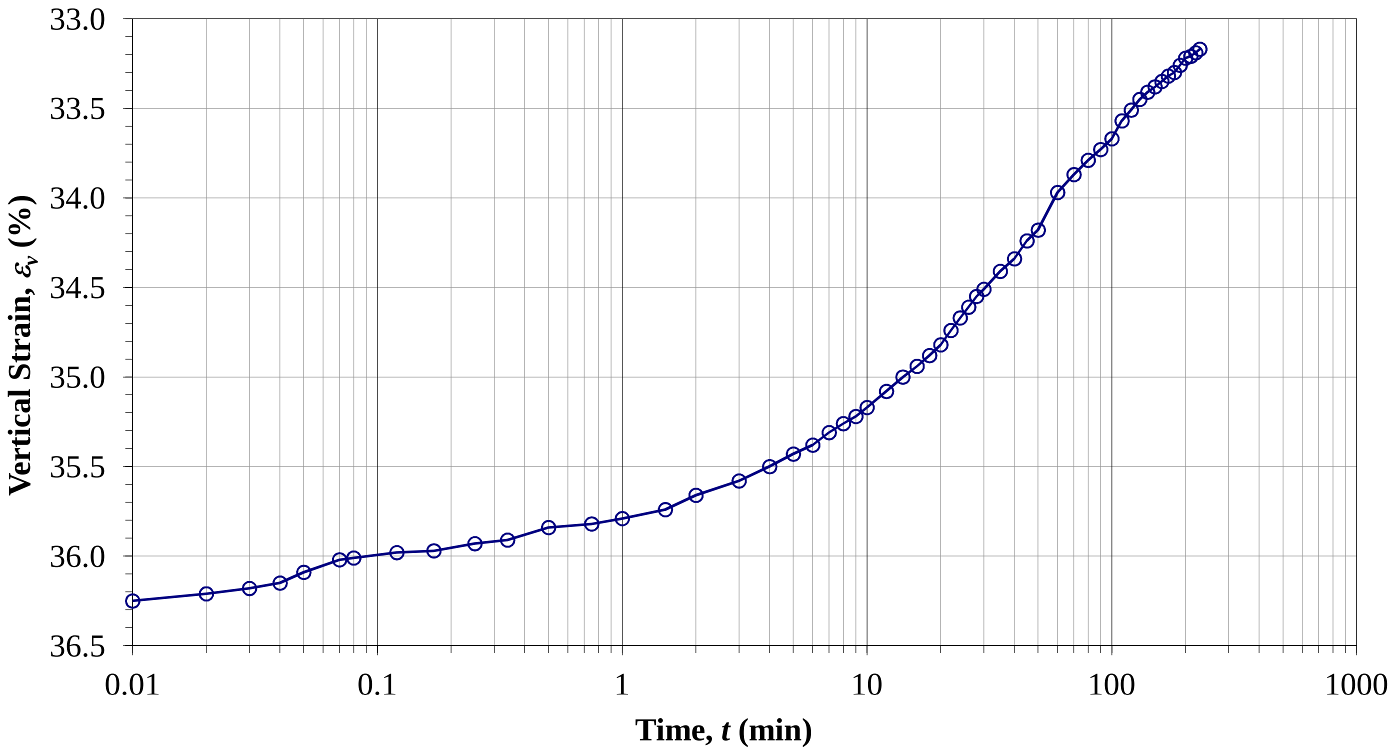
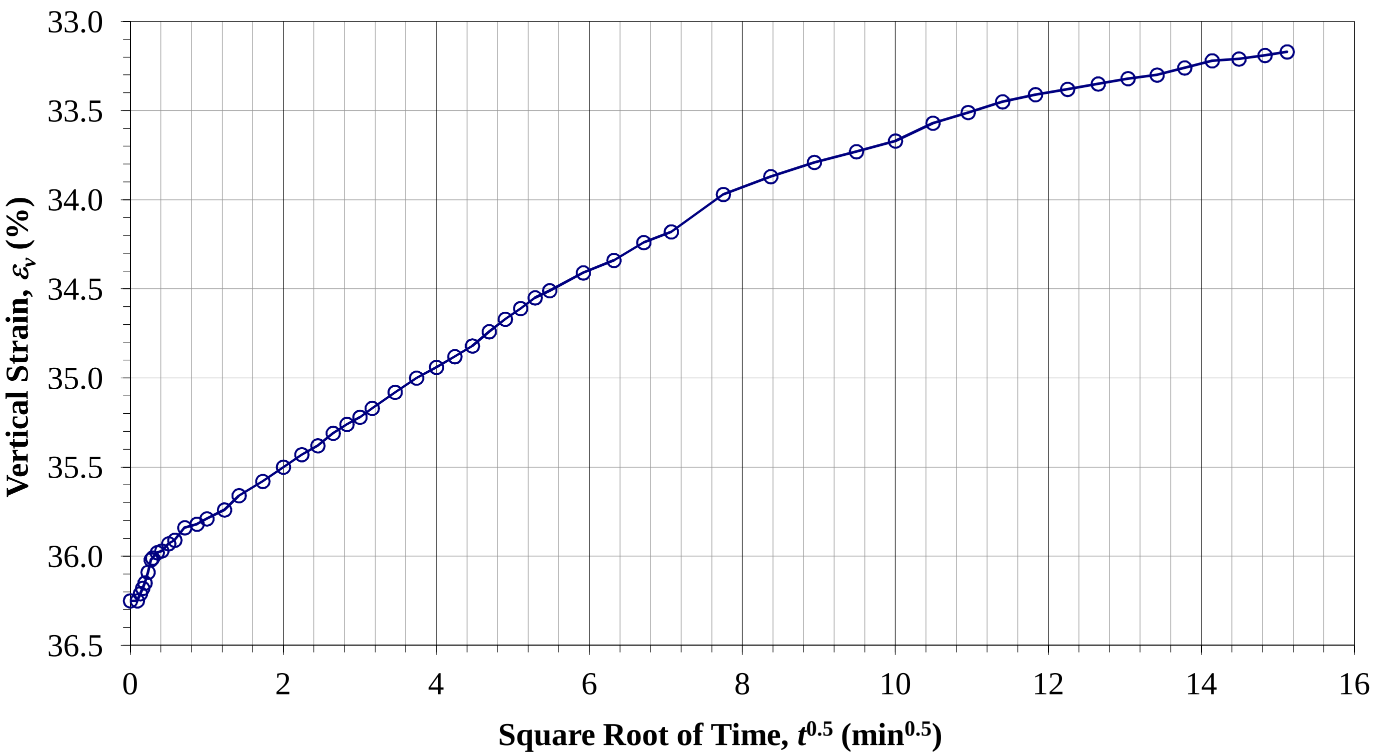
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-02
Sample:
Depth: 24.5'

Constant Load Step: 12 of 13
Stress: 1600 psf



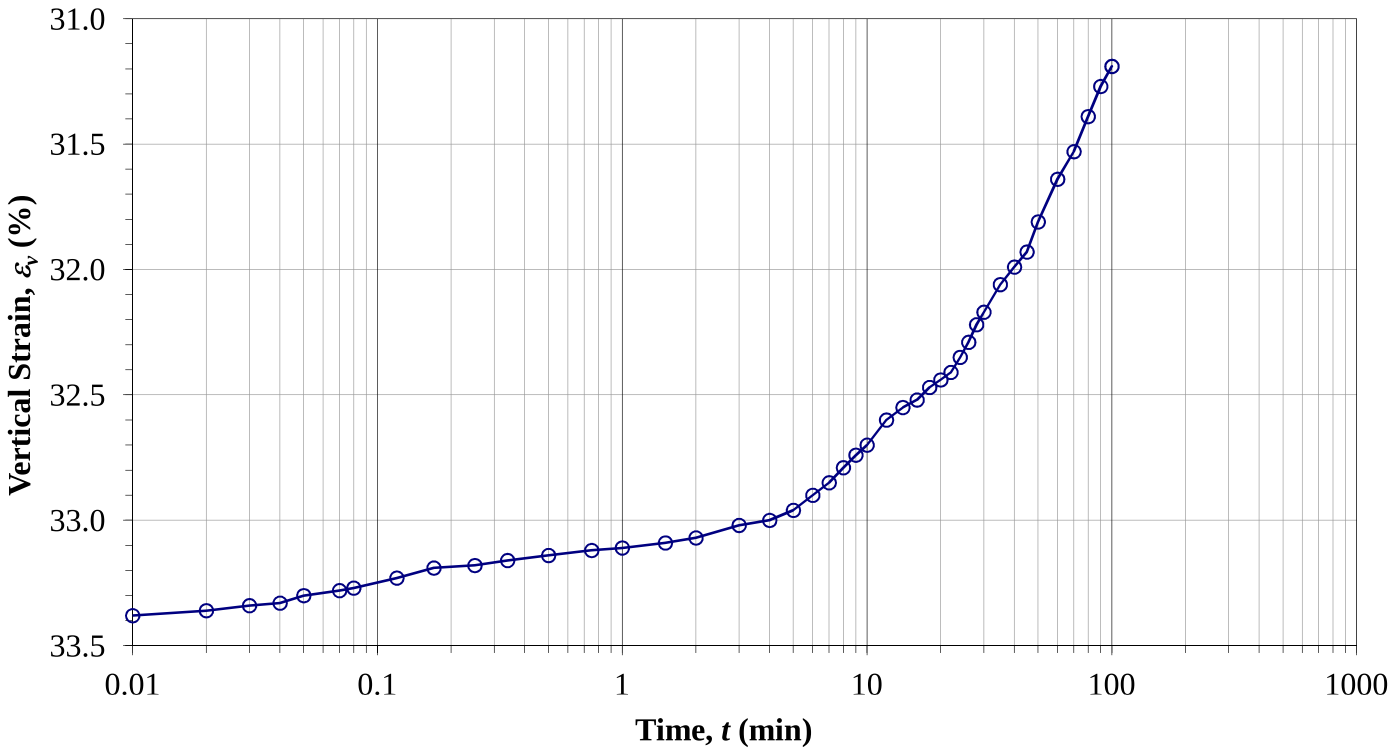


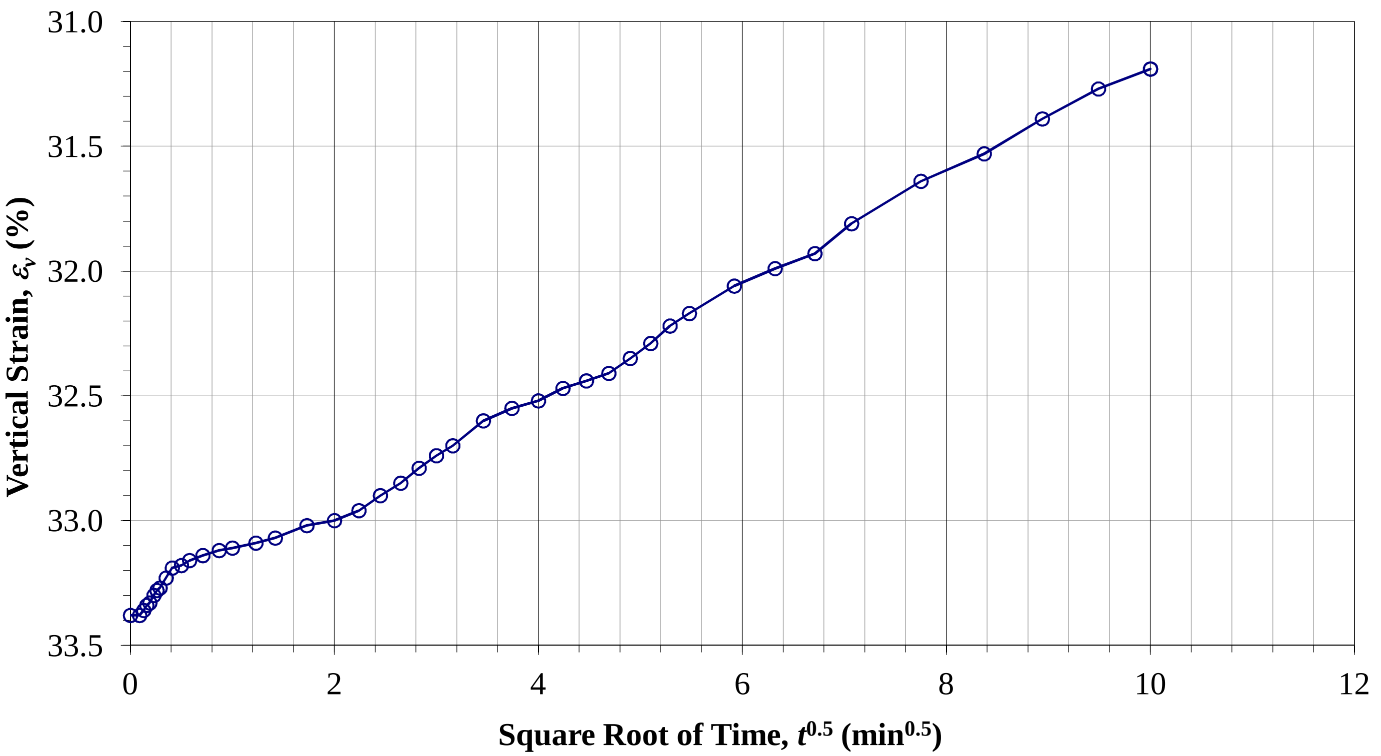
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-02
Sample:
Depth: 24.5'

Constant Load Step: 13 of 13
Stress: 400 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/19/2013
By: MP

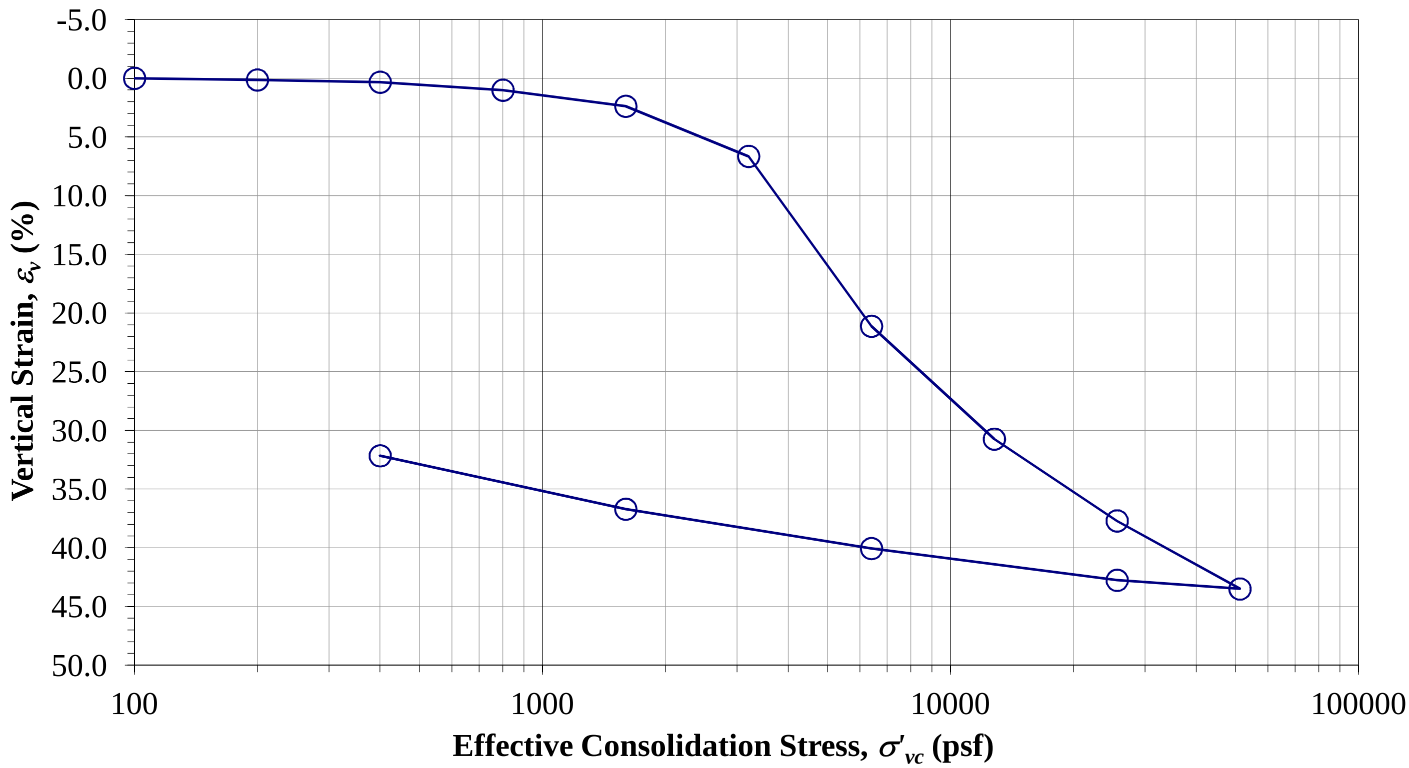
Boring No.: B-05
Sample:
Depth: 19.5'
Sample Description: Dark grey clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Test method:	B	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.6784
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	164.39	142.75
Wt. rings/tare (g)	42.49	42.49
Total unit wt., γ (pcf)	101.3	122.8
Wet soil + tare (g)	289.02	
Dry soil + tare (g)	224.06	
Tare (g)	127.01	
Water content, ω (%)	66.9	37.3
Dry unit wt., γ_d (pcf)	60.7	89.4
Saturation, S	1.00	1.00

*Note: C_v, C_c, C_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0000	0.00	1.0000	1.7469
100	-0.0001	-0.01	1.0001	1.7470
200	0.0014	0.14	0.9986	1.7431
400	0.0033	0.33	0.9967	1.7379
800	0.0101	1.01	0.9900	1.7193
1600	0.0238	2.38	0.9762	1.6815
3200	0.0665	6.65	0.9336	1.5643
6400	0.2112	21.12	0.7888	1.1667
12800	0.3073	30.73	0.6927	0.9028
25600	0.3770	37.70	0.6230	0.7113
51200	0.4350	43.50	0.5650	0.5520
25600	0.4276	42.76	0.5724	0.5723
6400	0.4006	40.06	0.5994	0.6465
1600	0.3671	36.71	0.6329	0.7385
400	0.3216	32.16	0.6784	0.8635



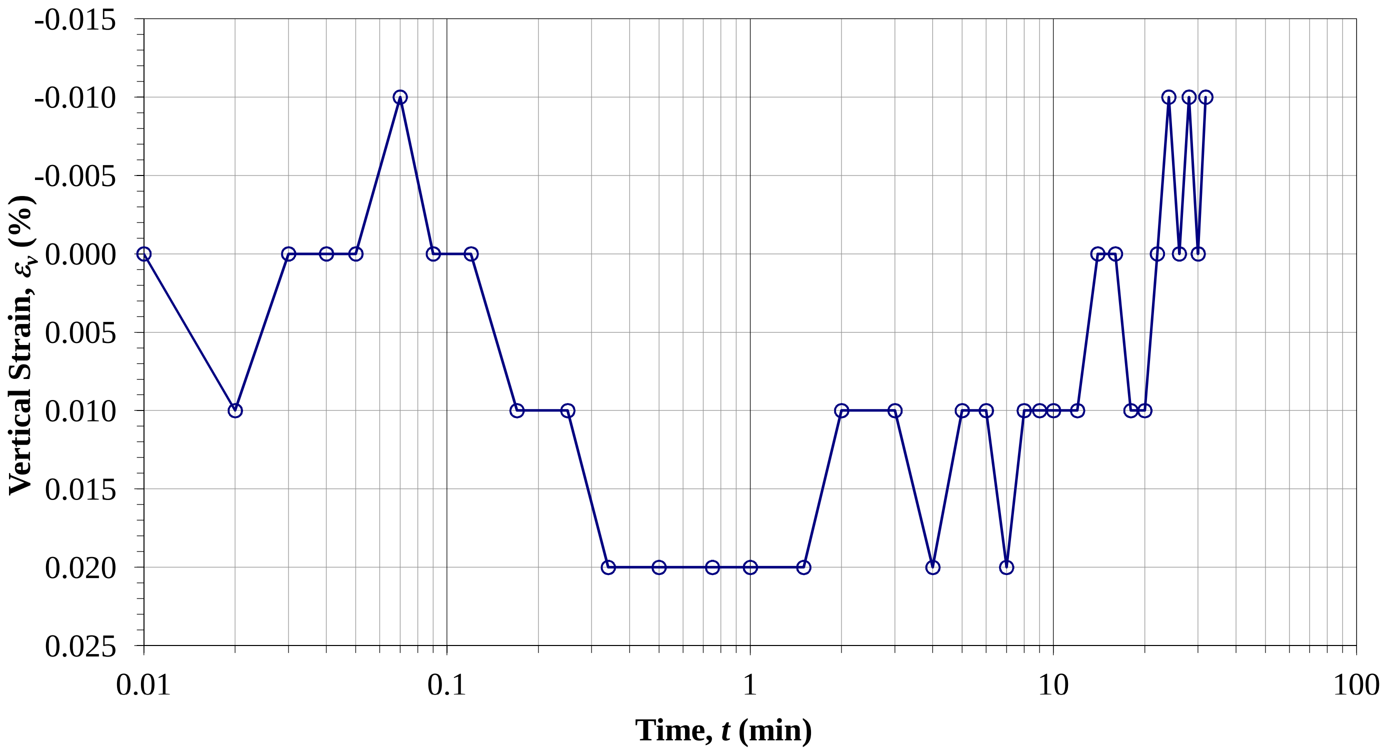
Comments: Specimen swelled upon inundation and at the 100 psf loading.

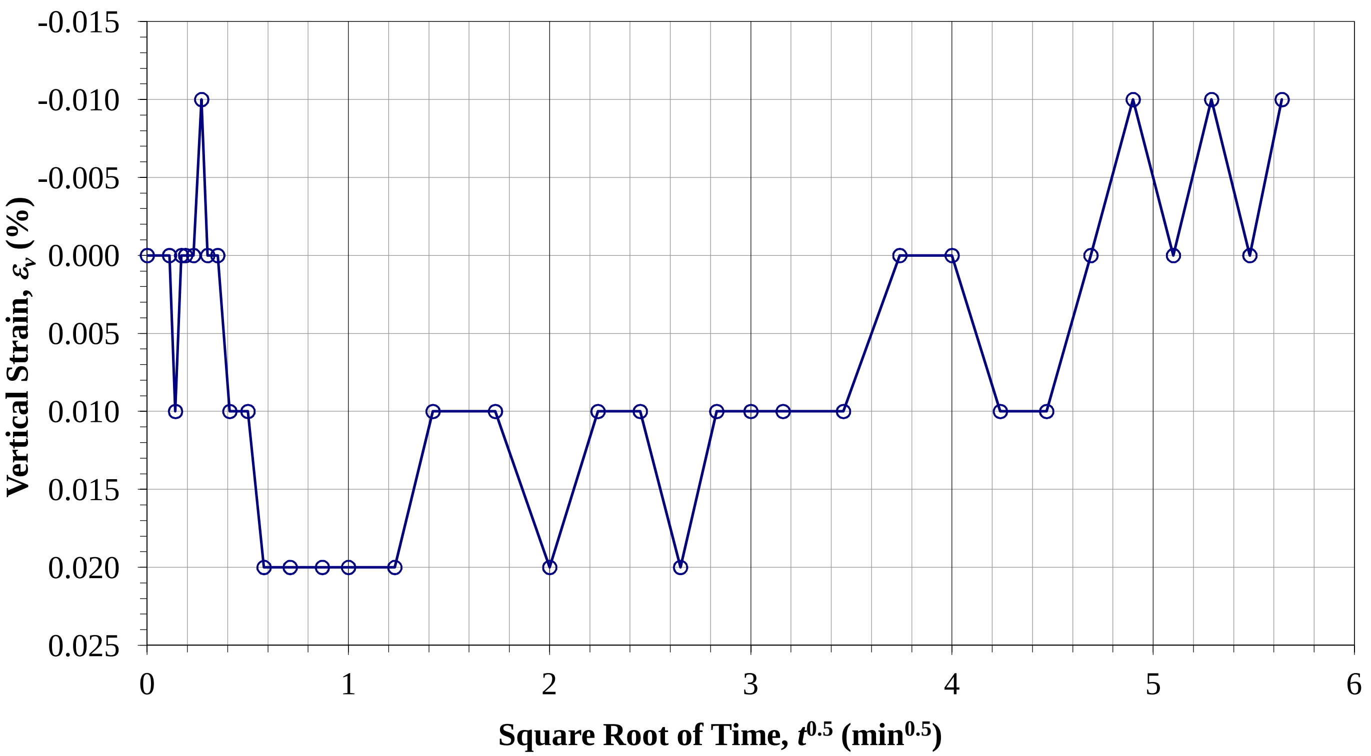
Entered: ________
Reviewed: ________

One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Boring No.: B-05
Sample:
Depth: 19.5'

Constant Load Step: 1 of 14
Stress: 100 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

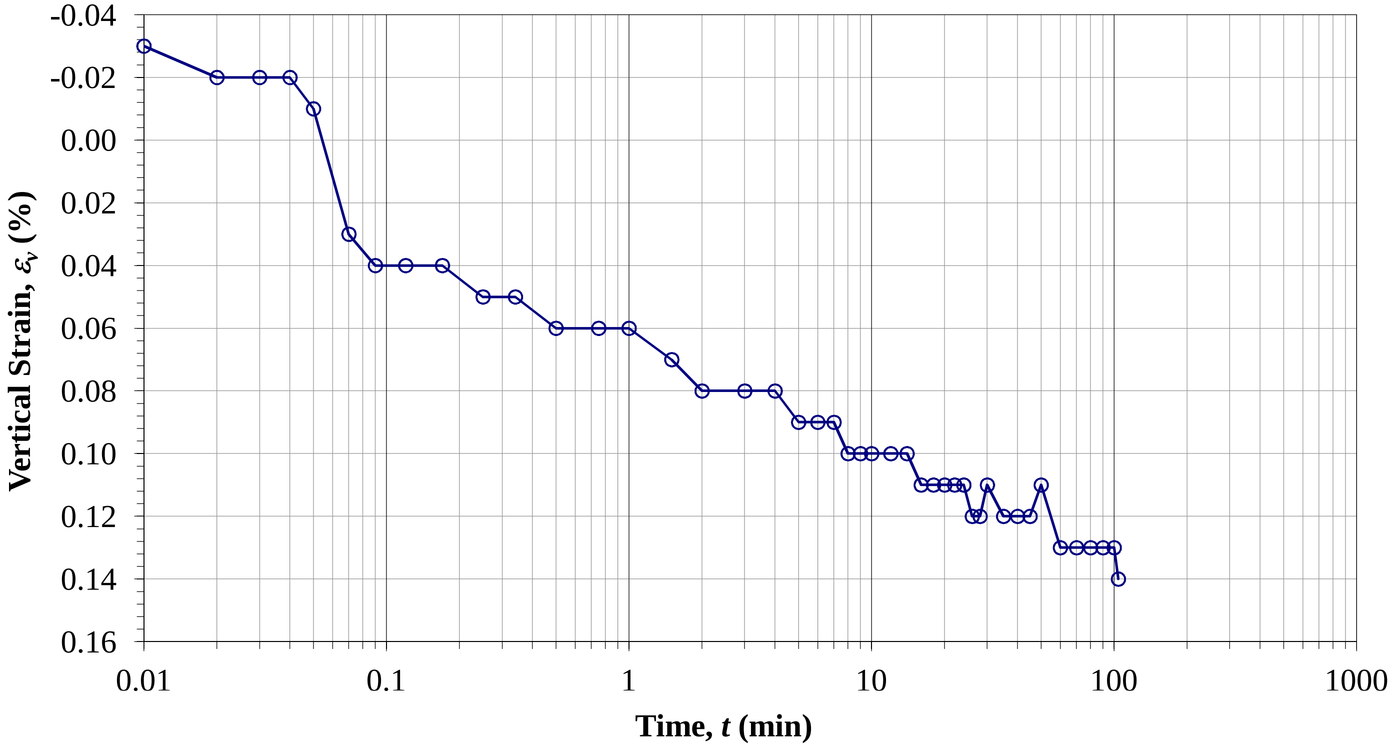
Project: Logan WWTP **Boring No.:** B-05

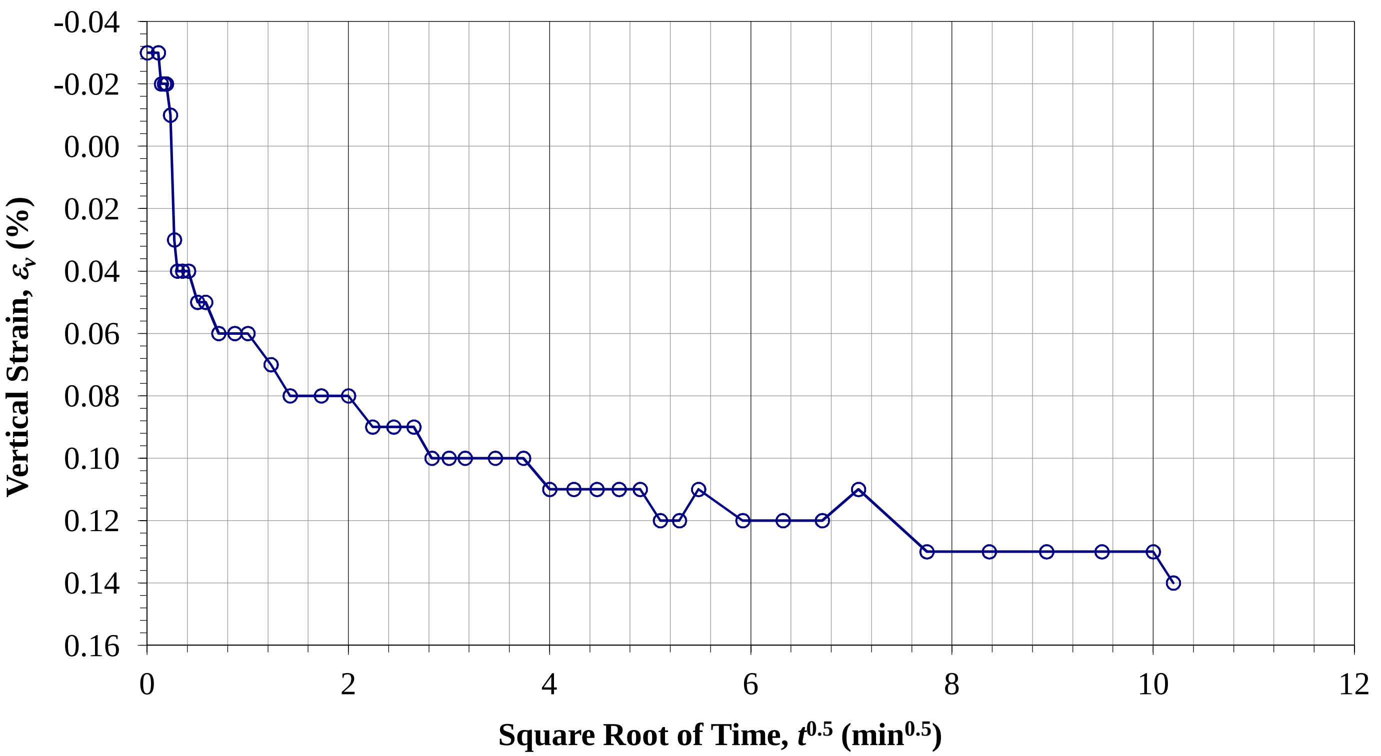
No: 00823-012 **Sample:**

Location: Logan, Utah **Depth:** 19.5'

Constant Load Step: 2 of 14

Stress: 200 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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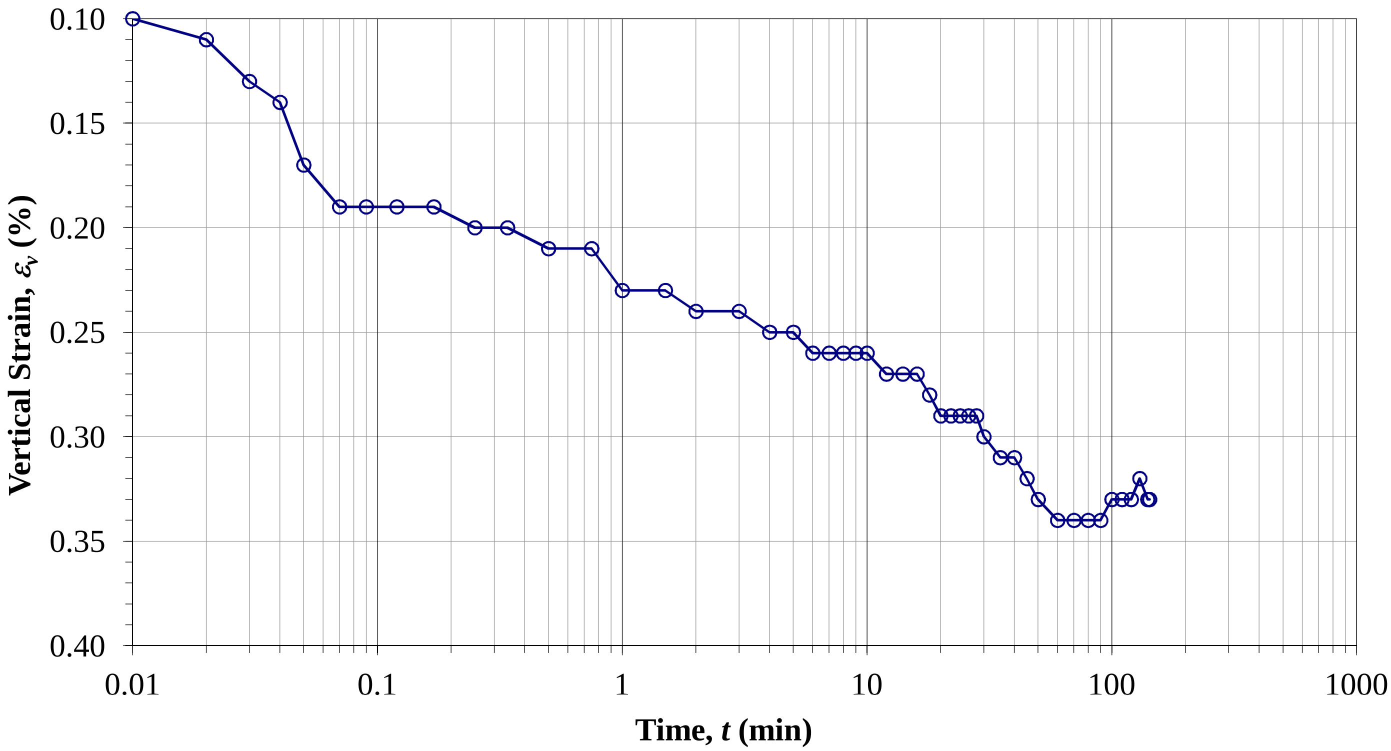
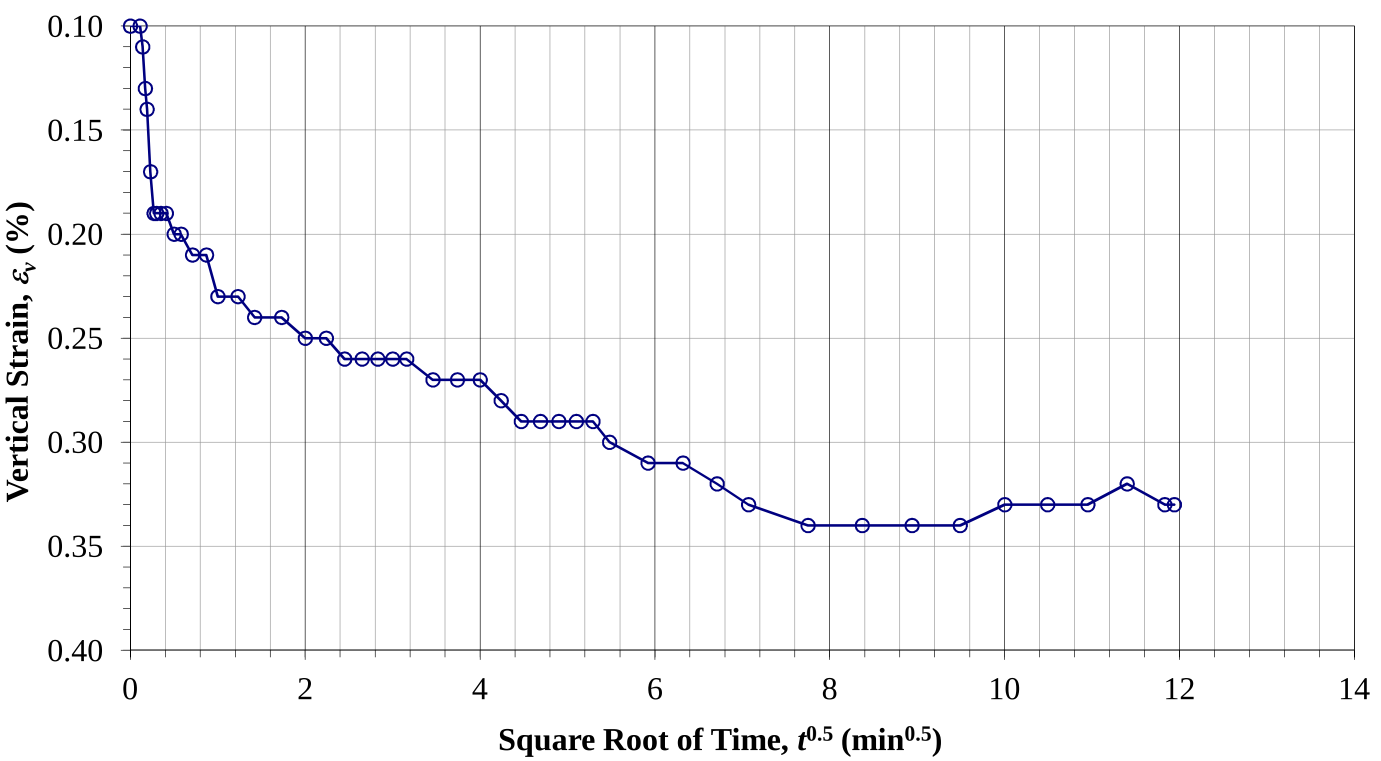
Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah

Boring No.: **B-05**
Sample:
Depth: **19.5'**

Constant Load Step: 3 of 14
Stress: 400 psf



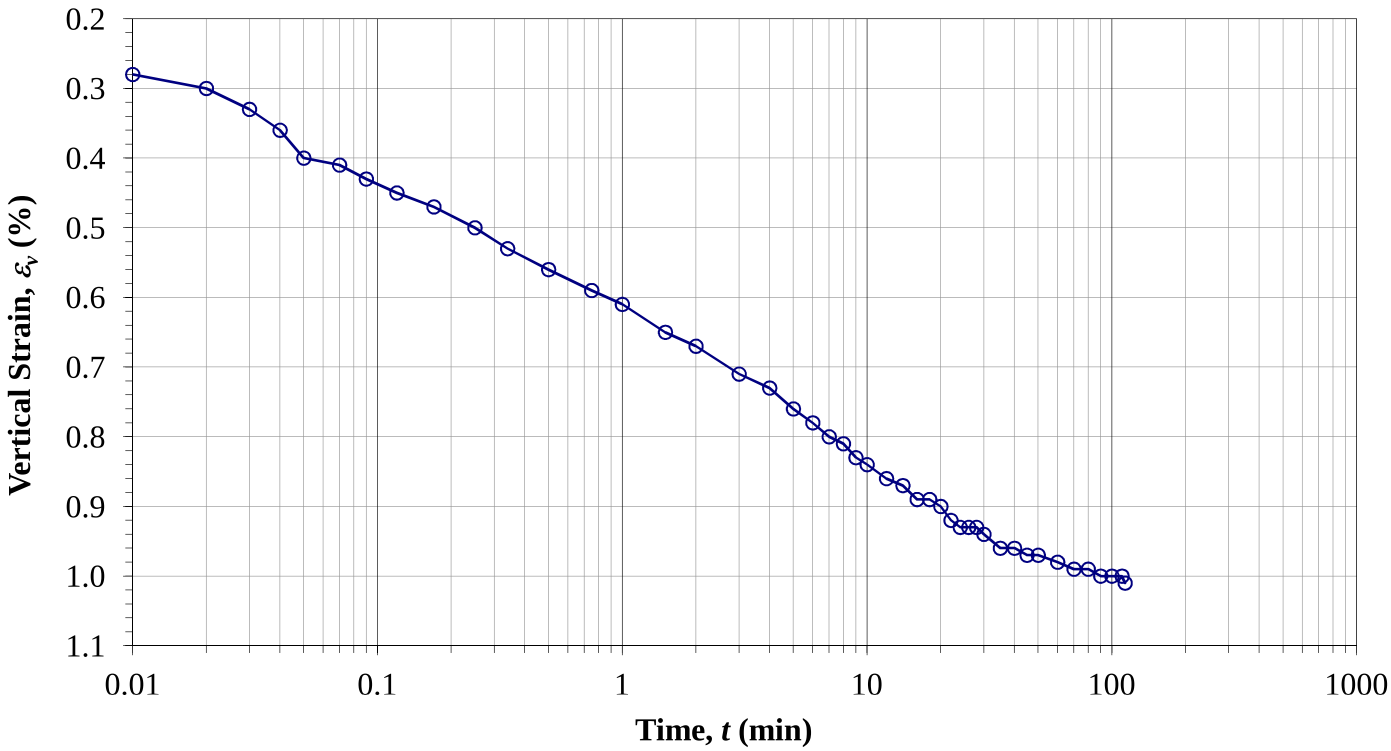


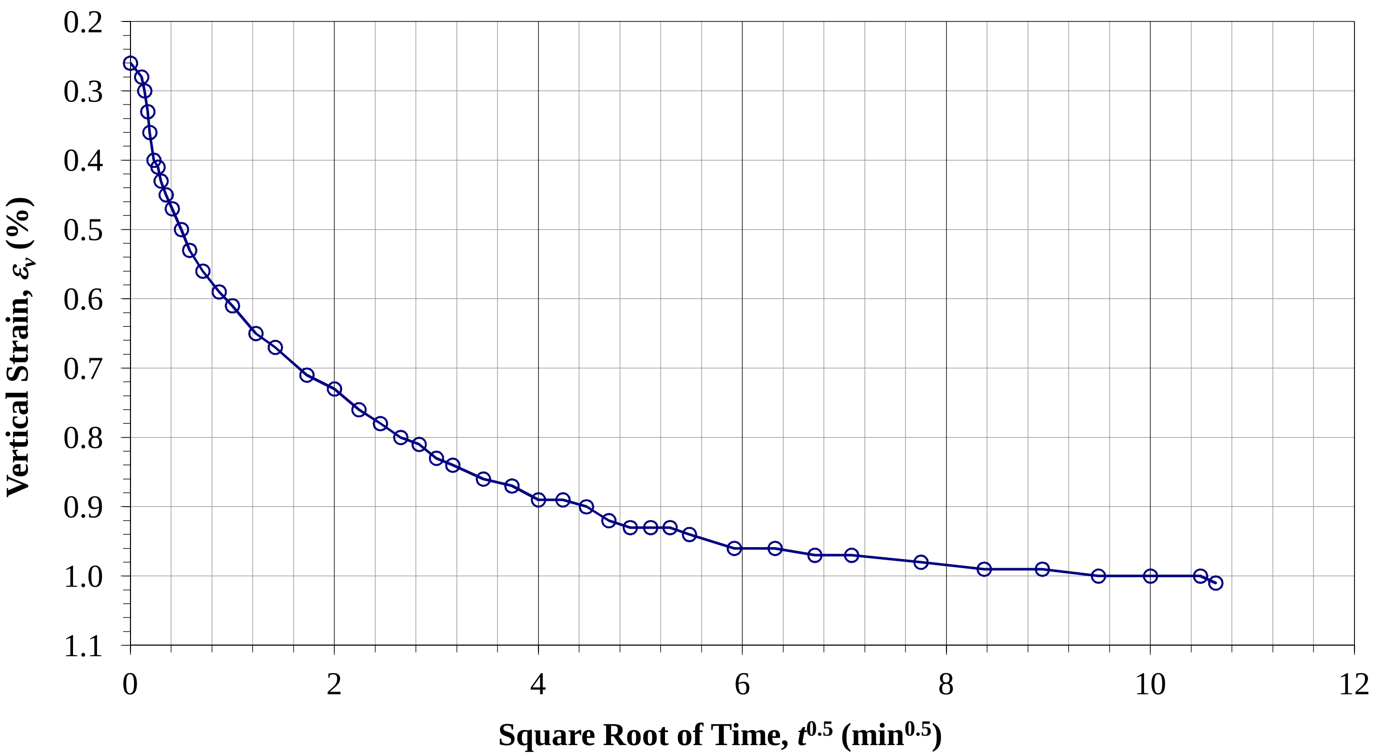
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 19.5'

Constant Load Step: 4 of 14
Stress: 800 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

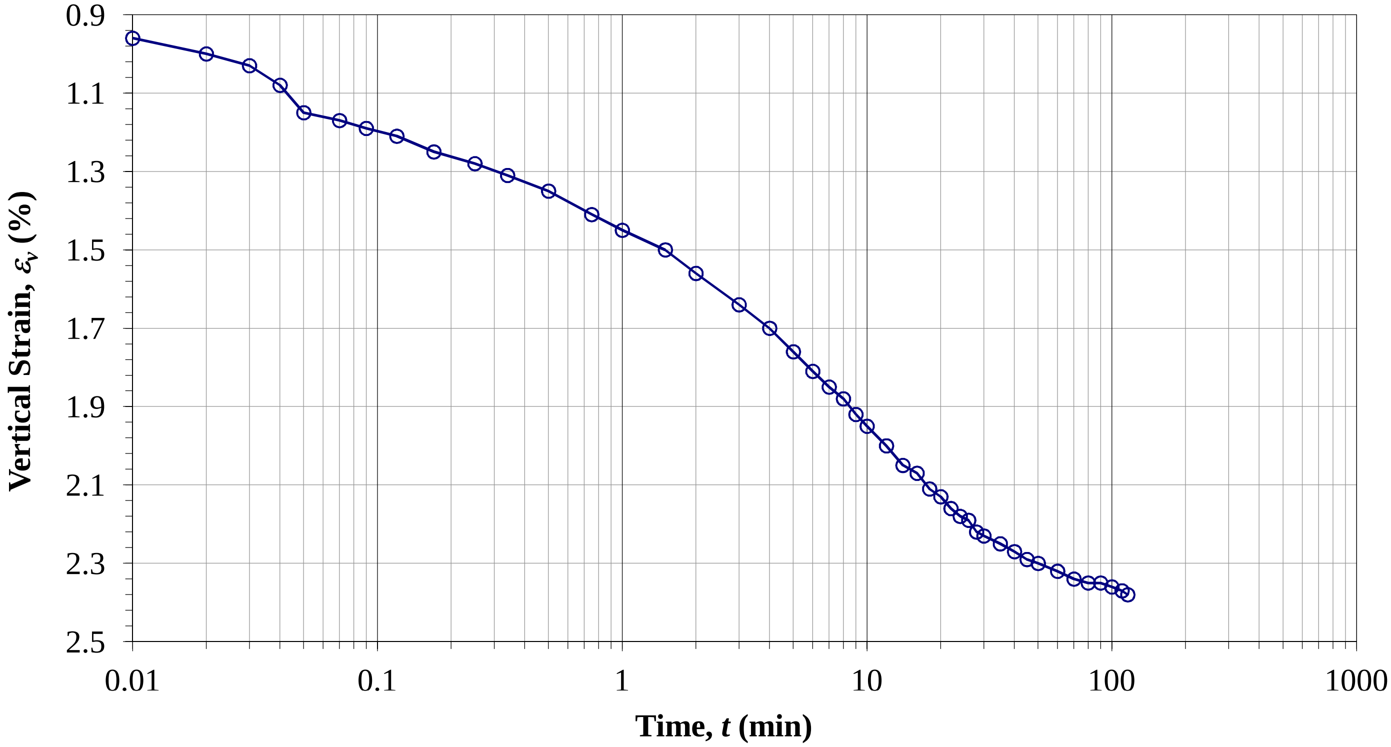
Project: Logan WWTP
Boring No.: B-05

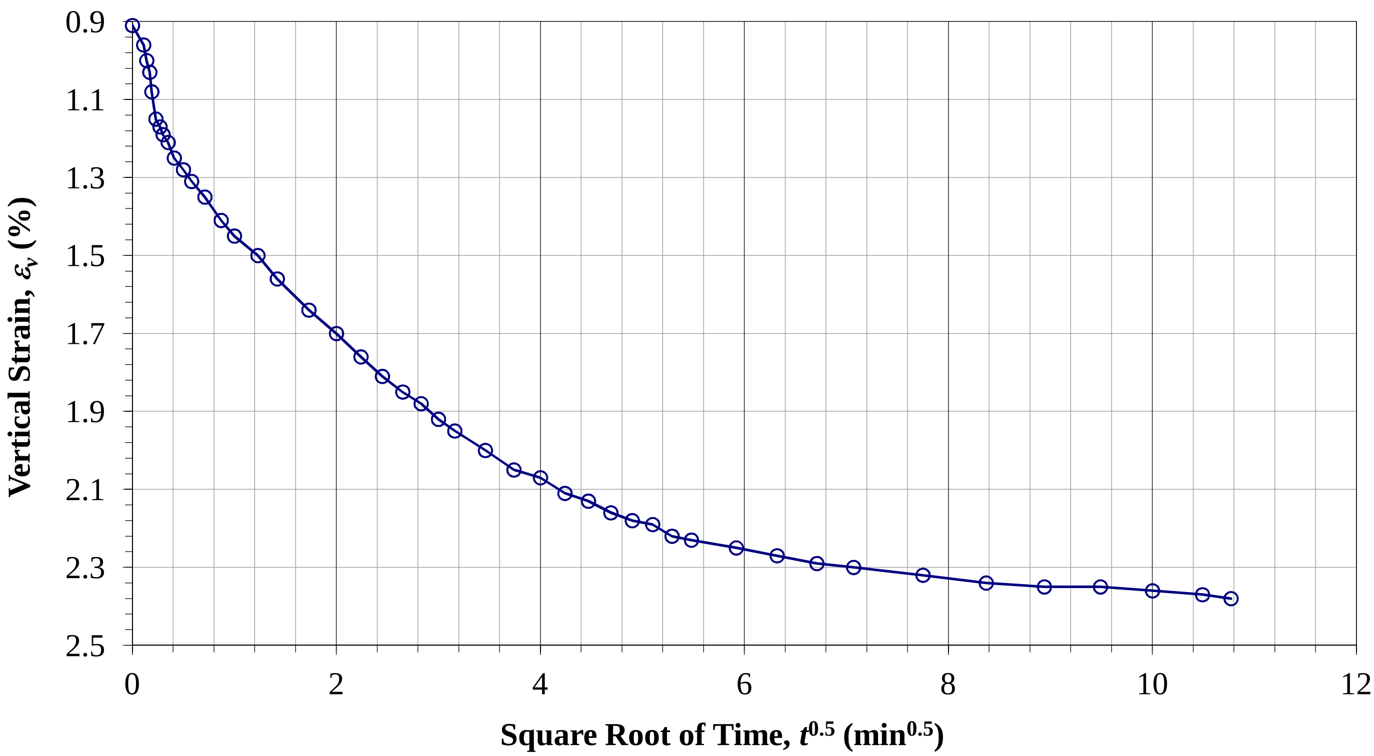
No: 00823-012
Sample:

Location: Logan, Utah
Depth: 19.5'

Constant Load Step: 5 of 14

Stress: 1600 psf





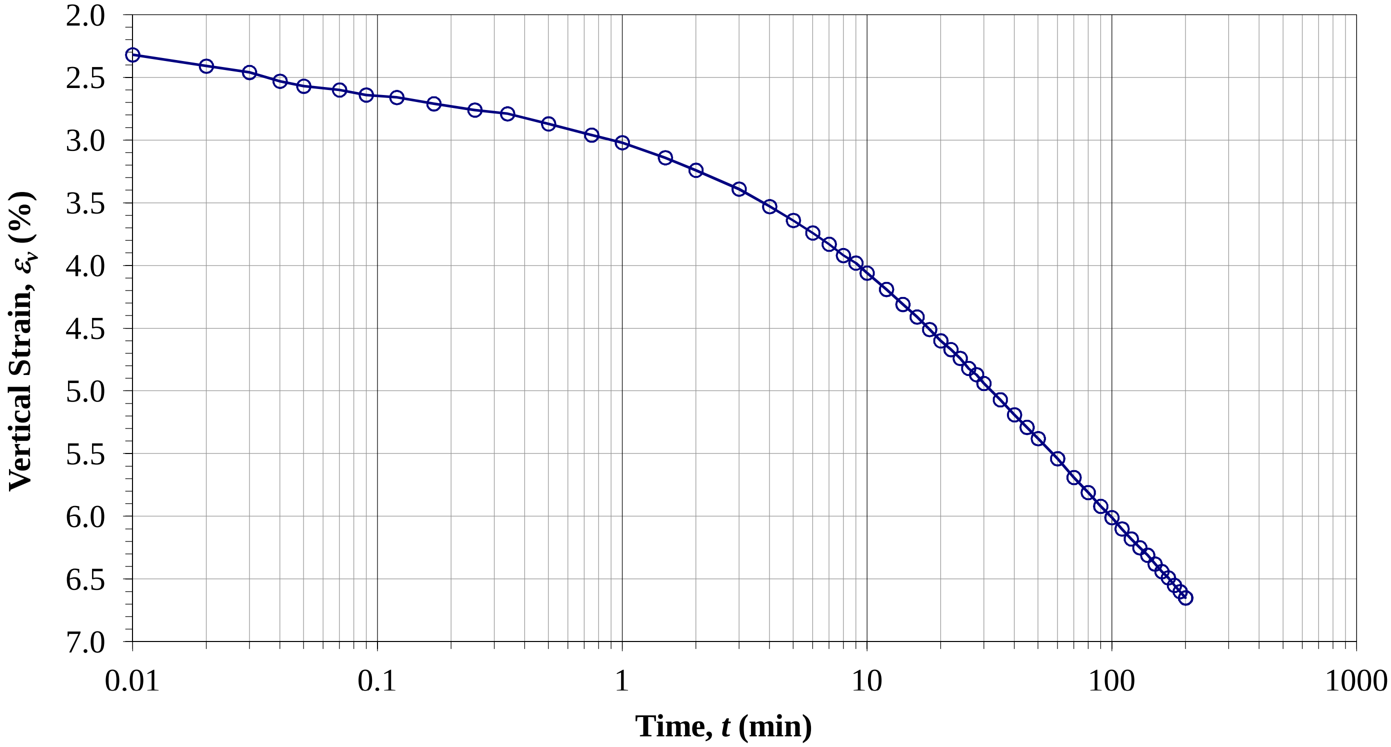
One-Dimensional Consolidation Properties of Soils

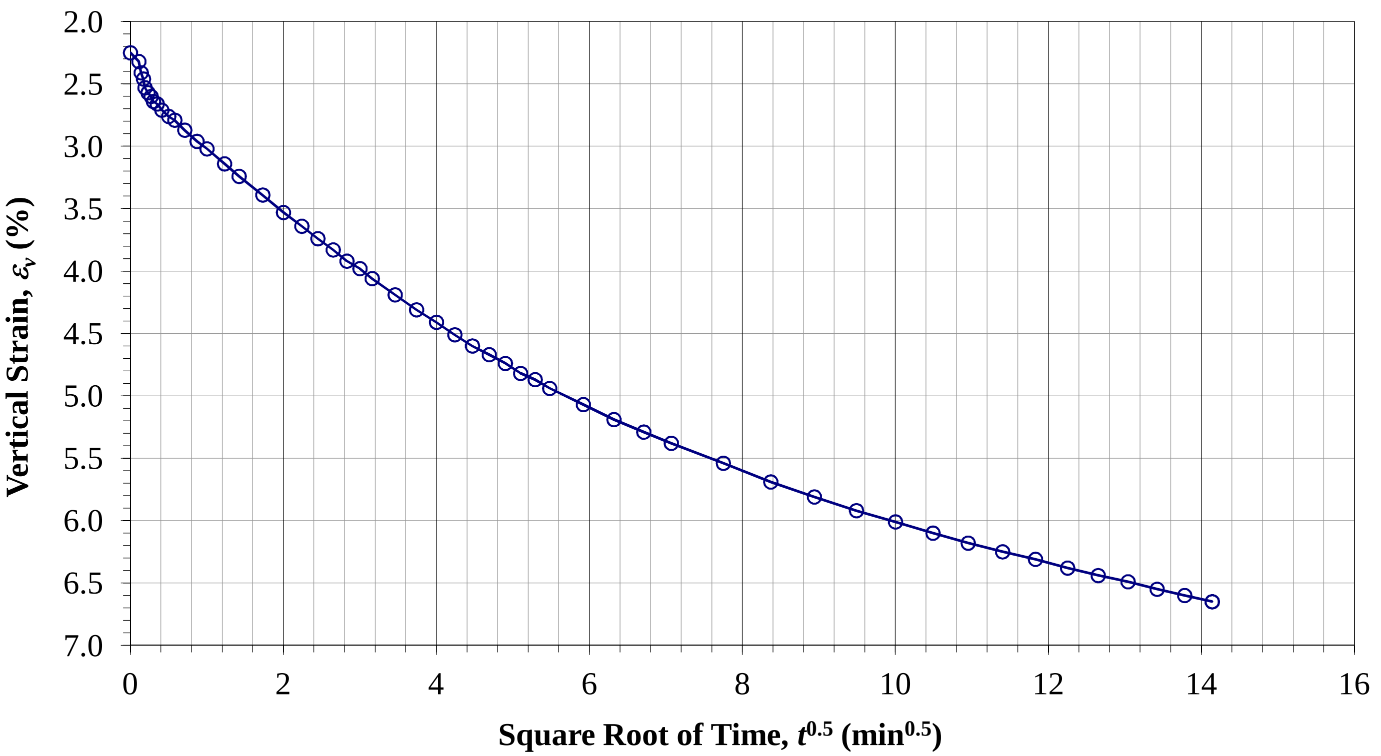
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 19.5'

Constant Load Step: 6 of 14
Stress: 3200 psf



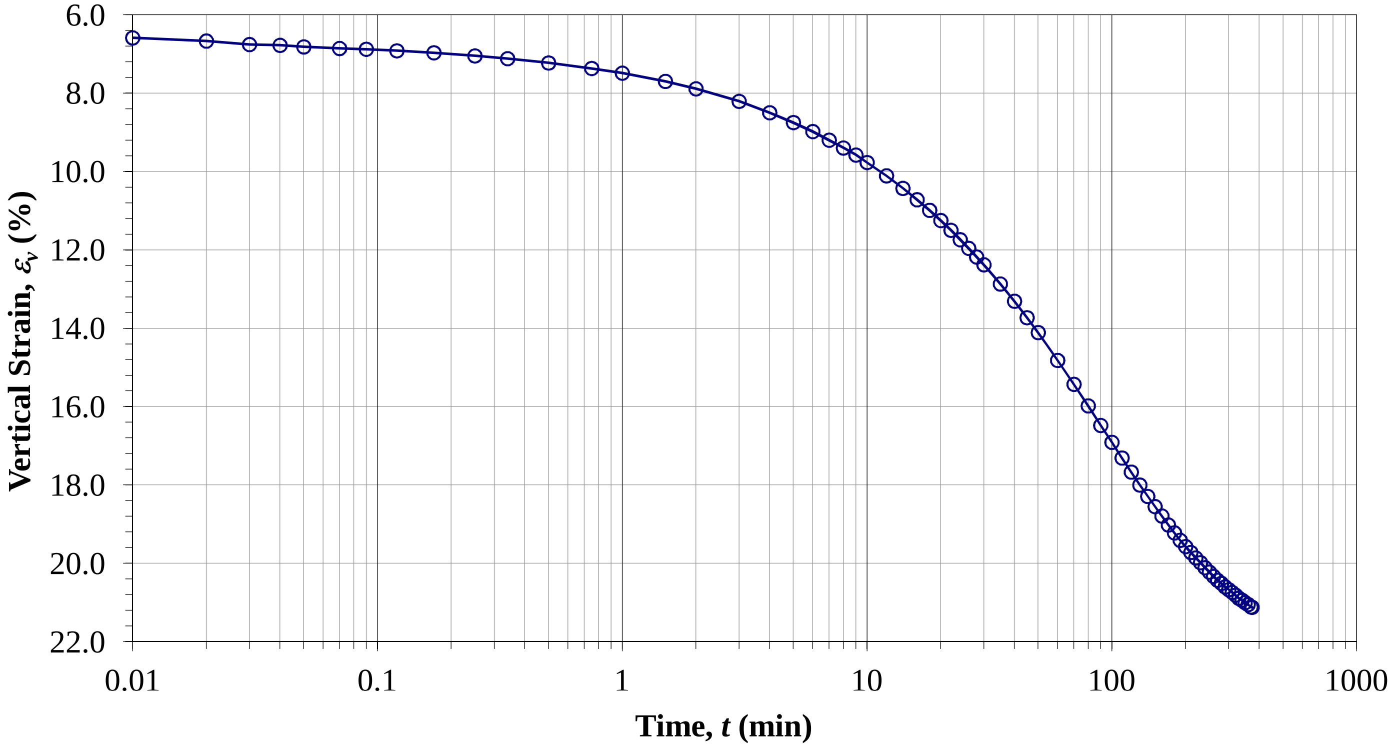


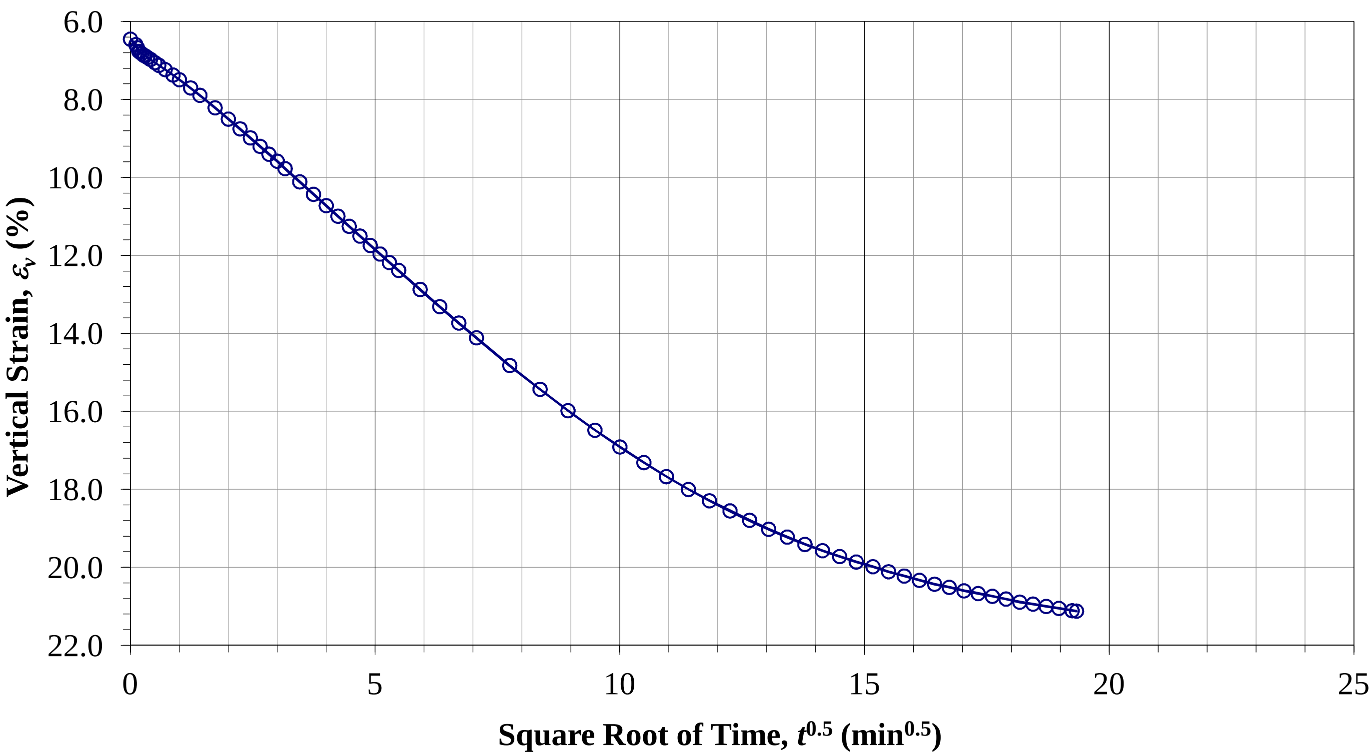
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 19.5'

Constant Load Step: 7 of 14
Stress: 6400 psf



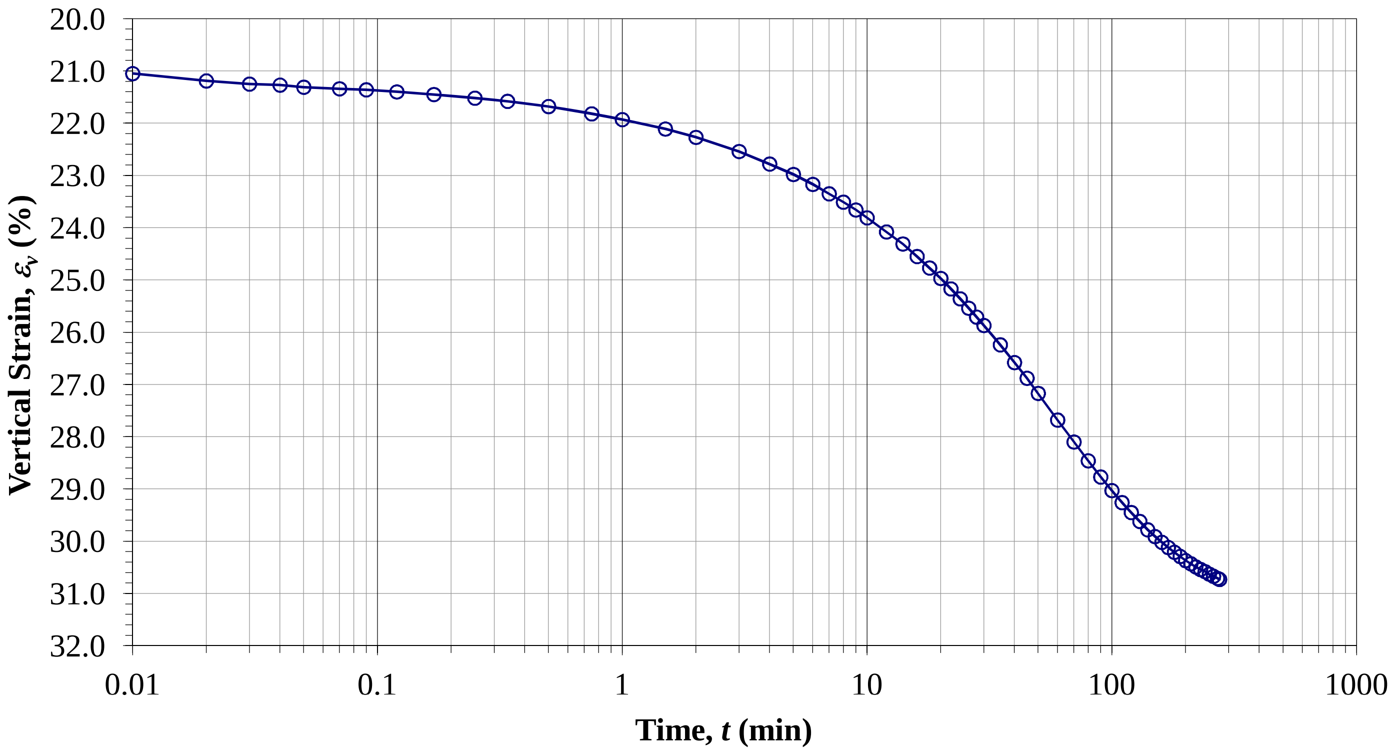


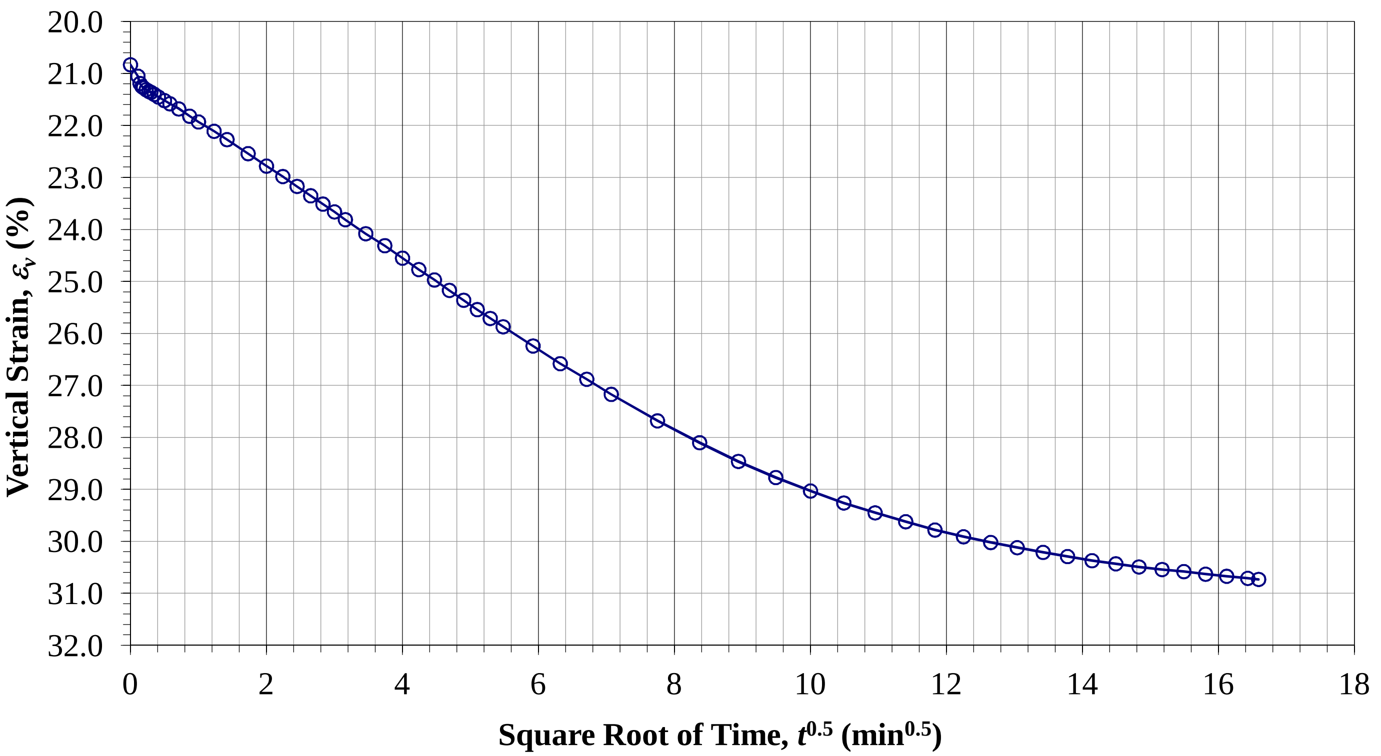
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 19.5'

Constant Load Step: 8 of 14
Stress: 12800 psf





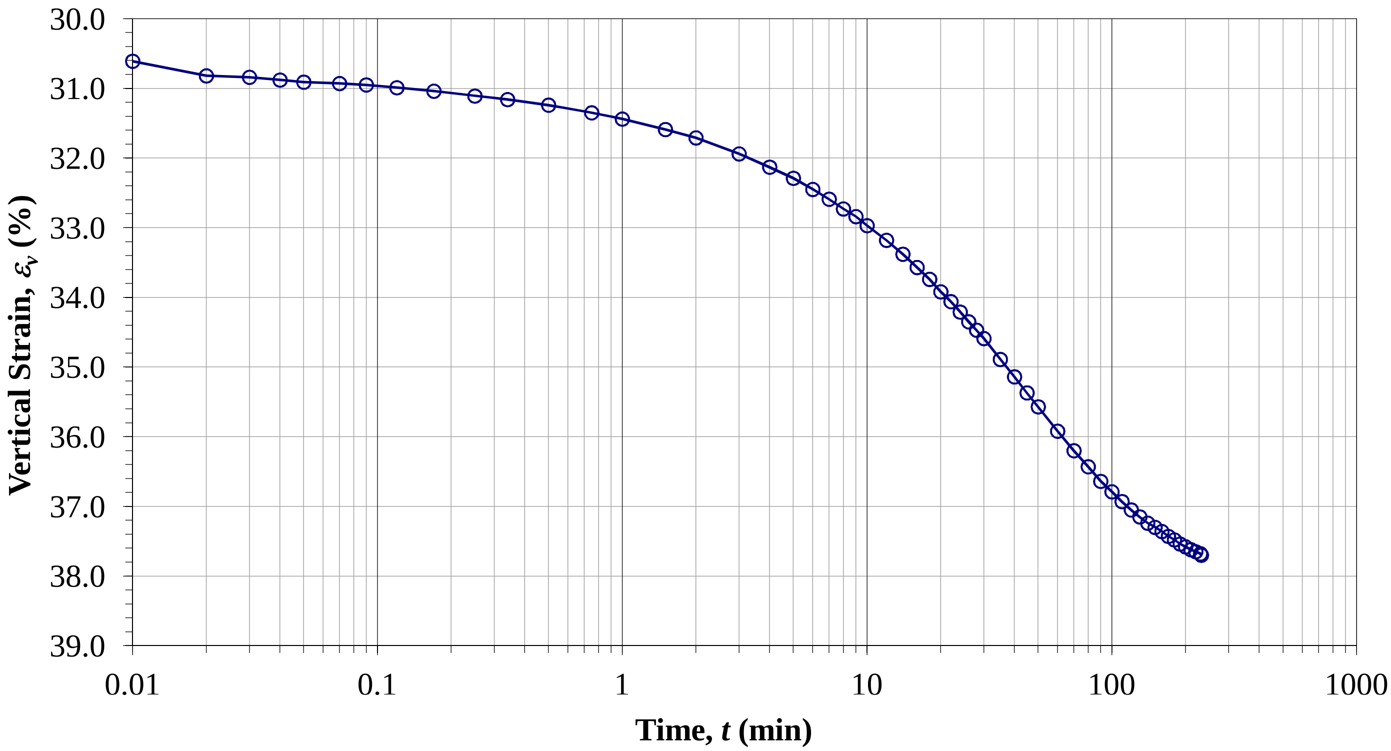
One-Dimensional Consolidation Properties of Soils

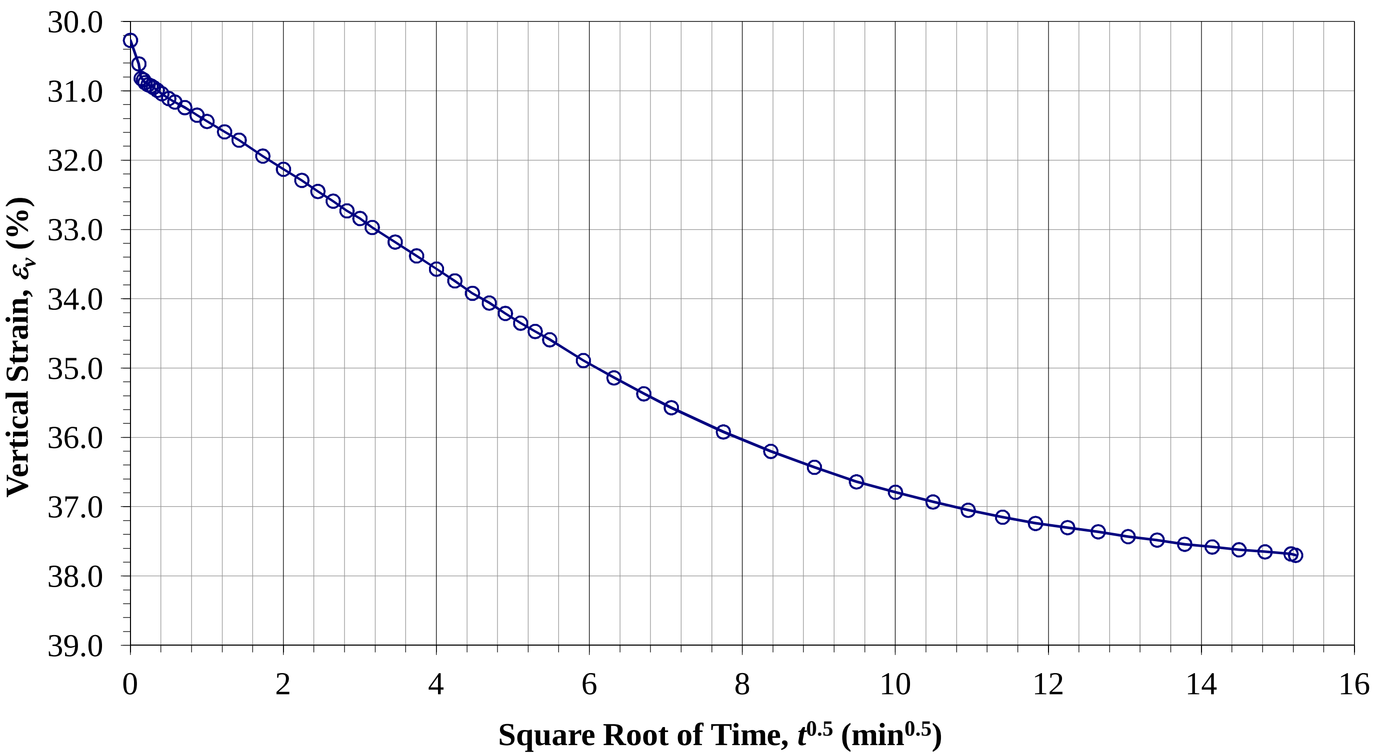
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 19.5'

Constant Load Step: 9 of 14
Stress: 25600 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP

No: 00823-012

Location: Logan, Utah

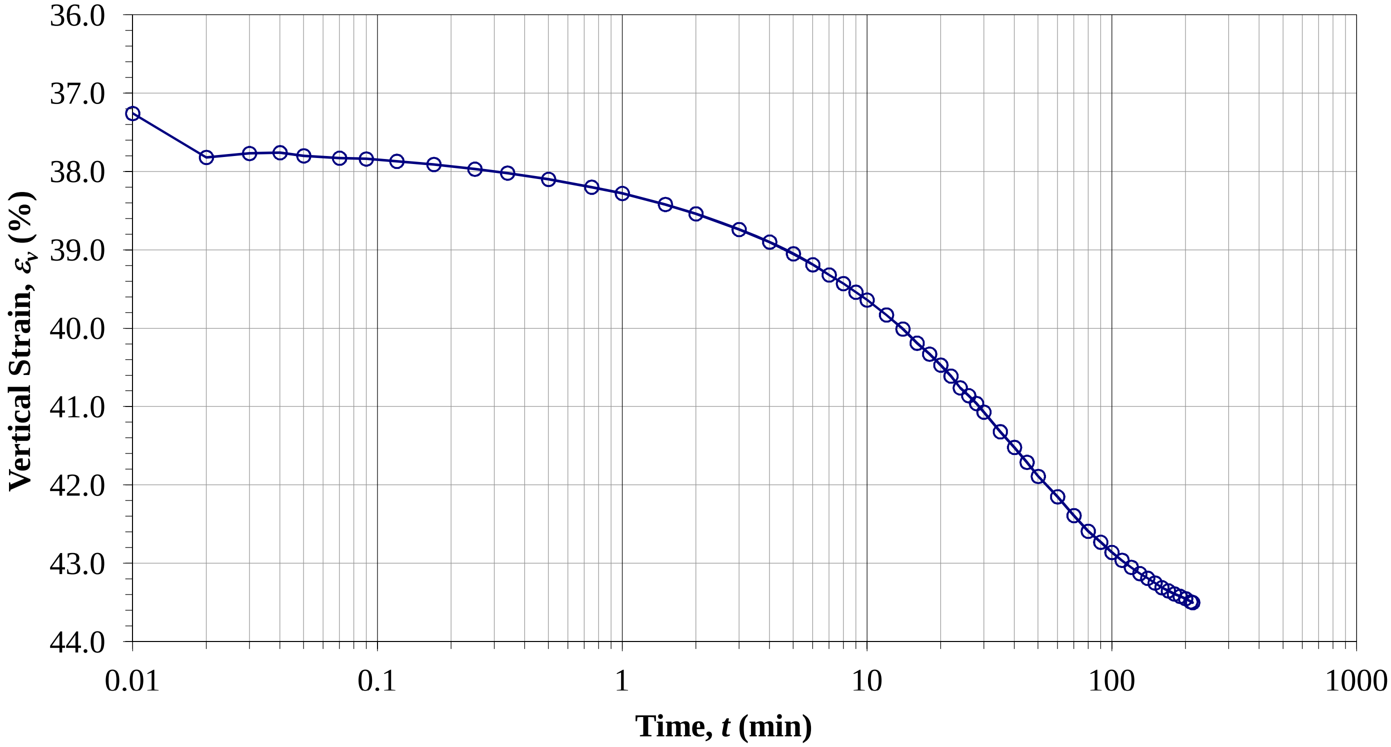
Boring No.: B-05

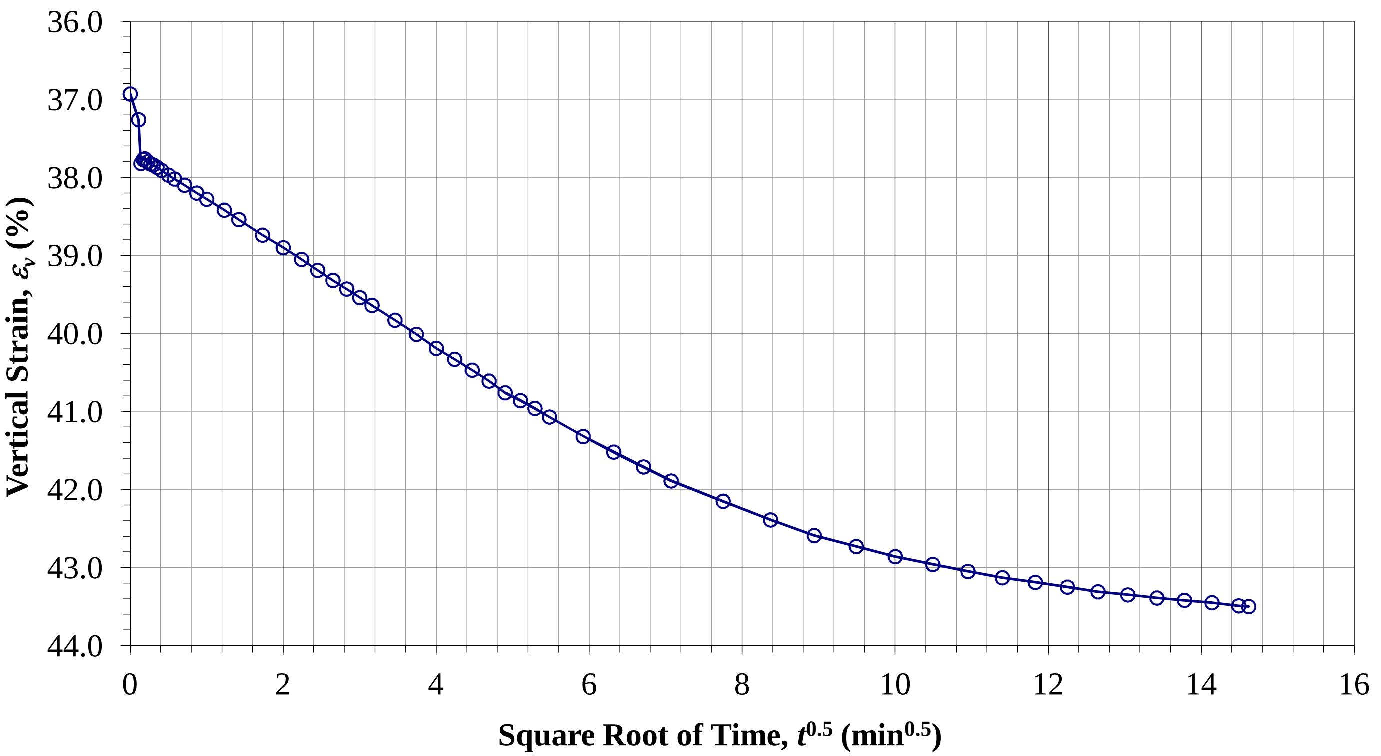
Sample:

Depth: 19.5'

Constant Load Step: 10 of 14

Stress: 51200 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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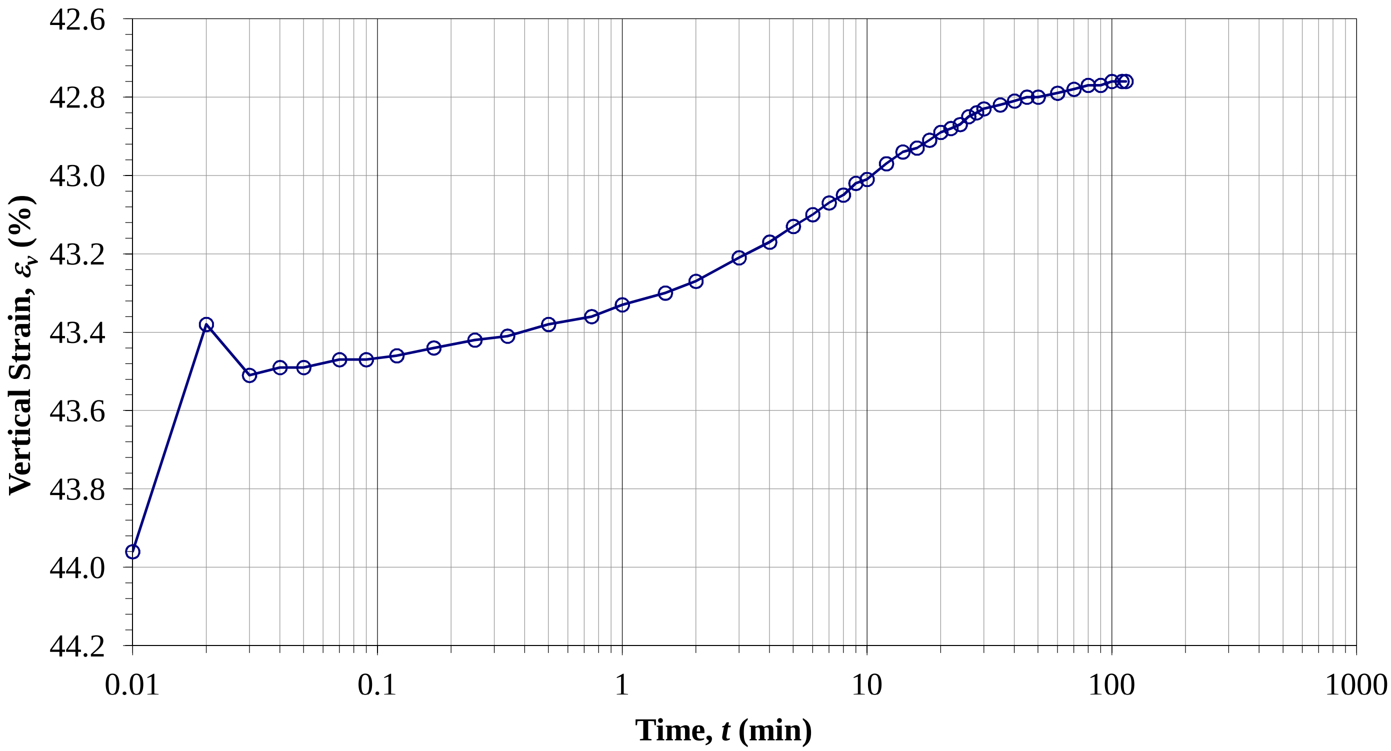
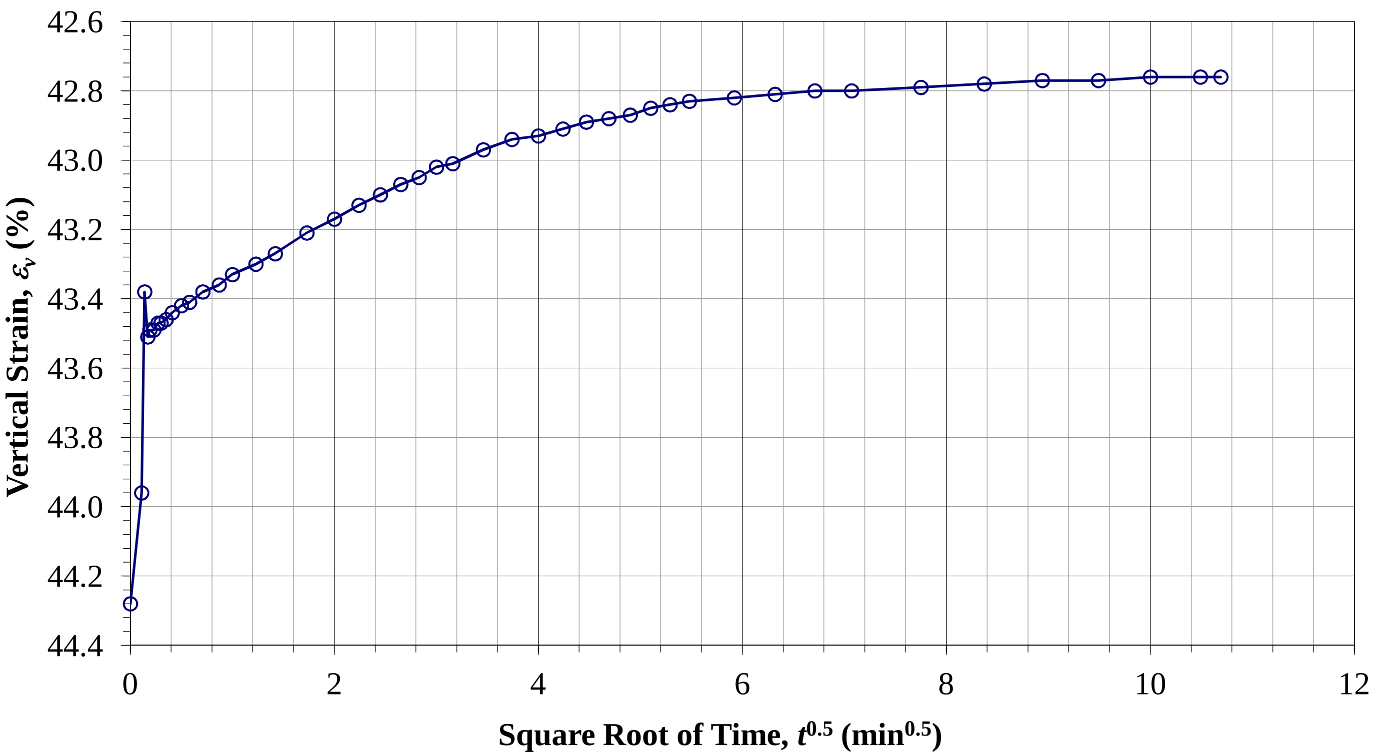
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 19.5'

Constant Load Step: 11 of 14
Stress: 25600 psf



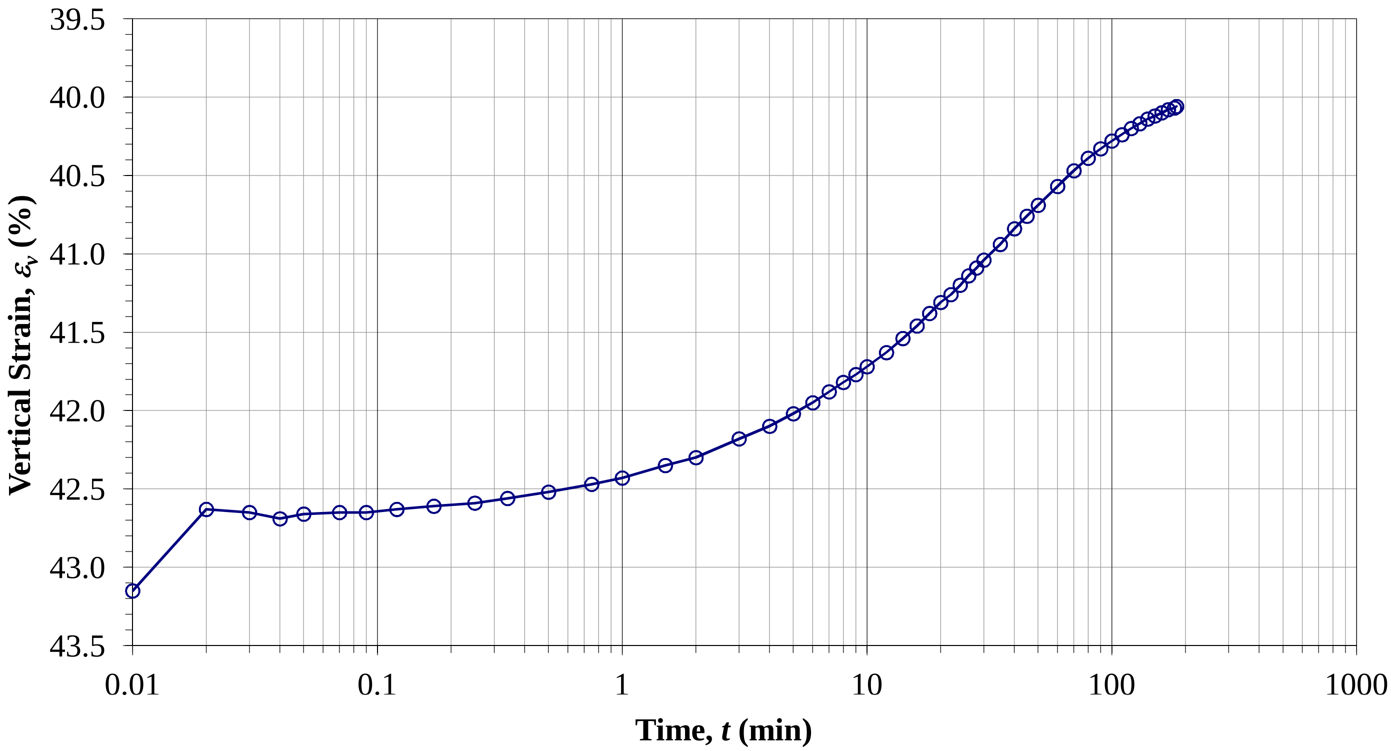


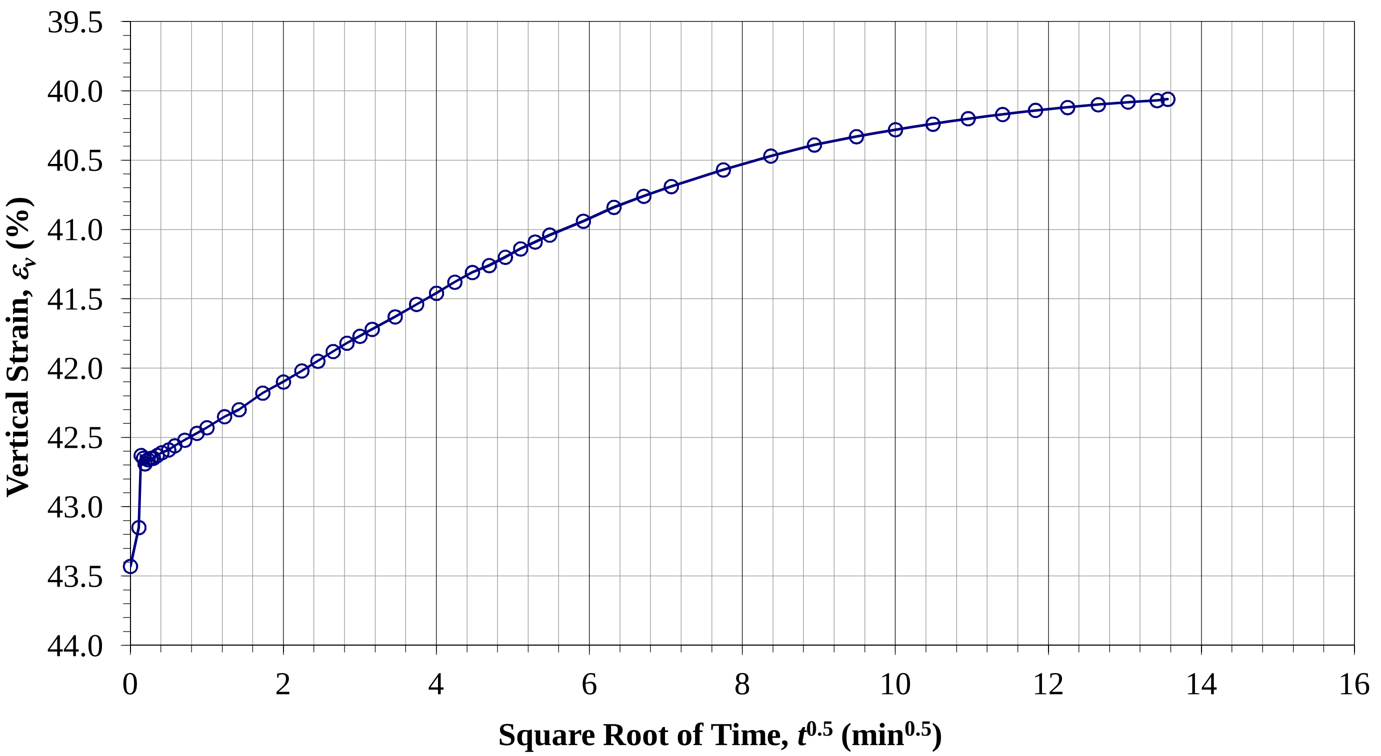
One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP | **Boring No.:** B-05
No: 00823-012 | **Sample:**
Location: Logan, Utah | **Depth:** 19.5'

Constant Load Step: 12 of 14
Stress: 6400 psf



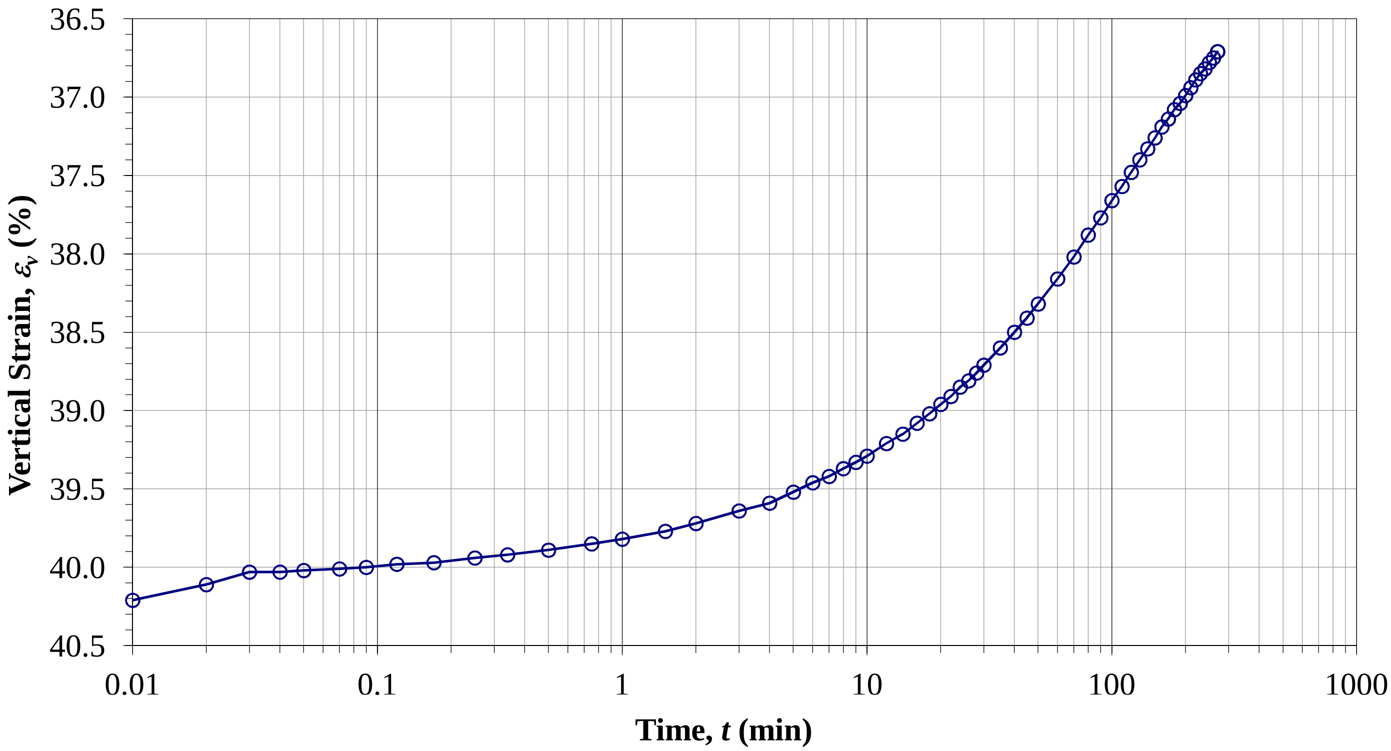


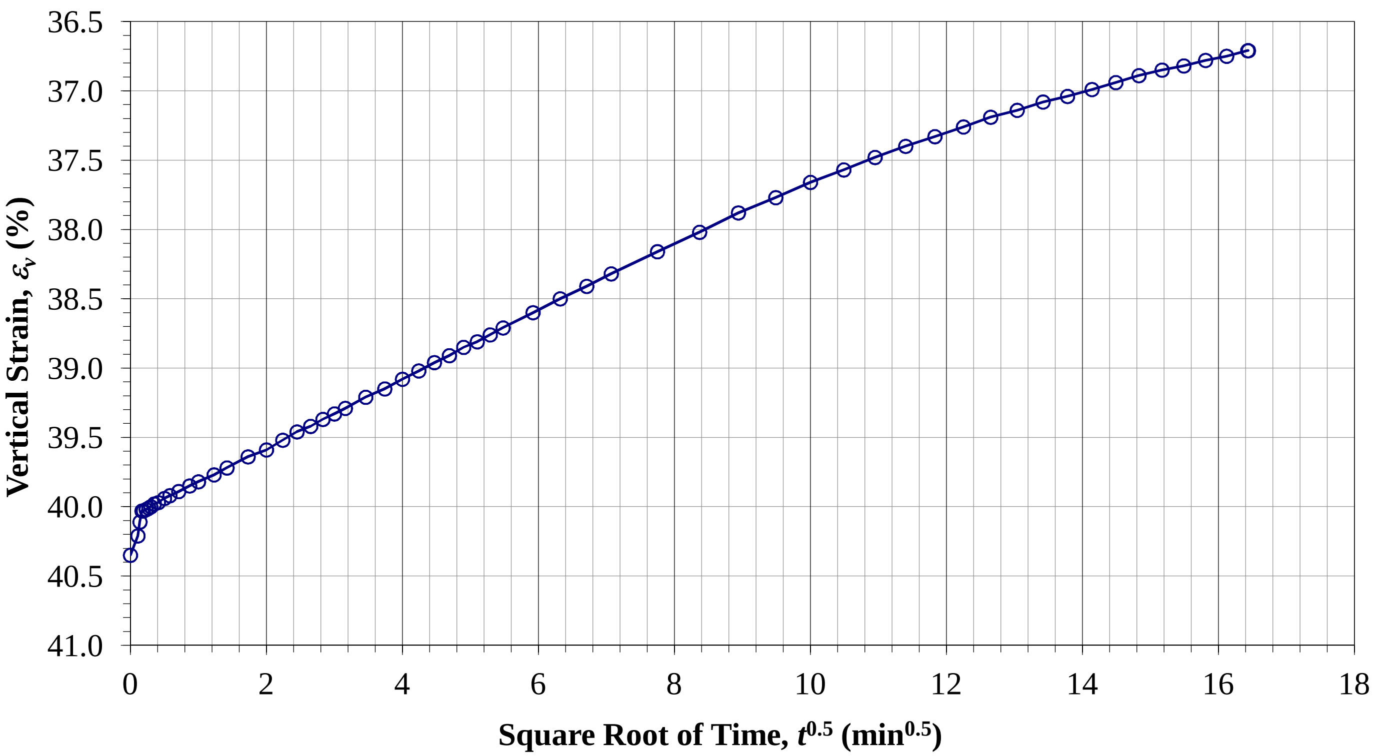
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 19.5'

Constant Load Step: 13 of 14
Stress: 1600 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

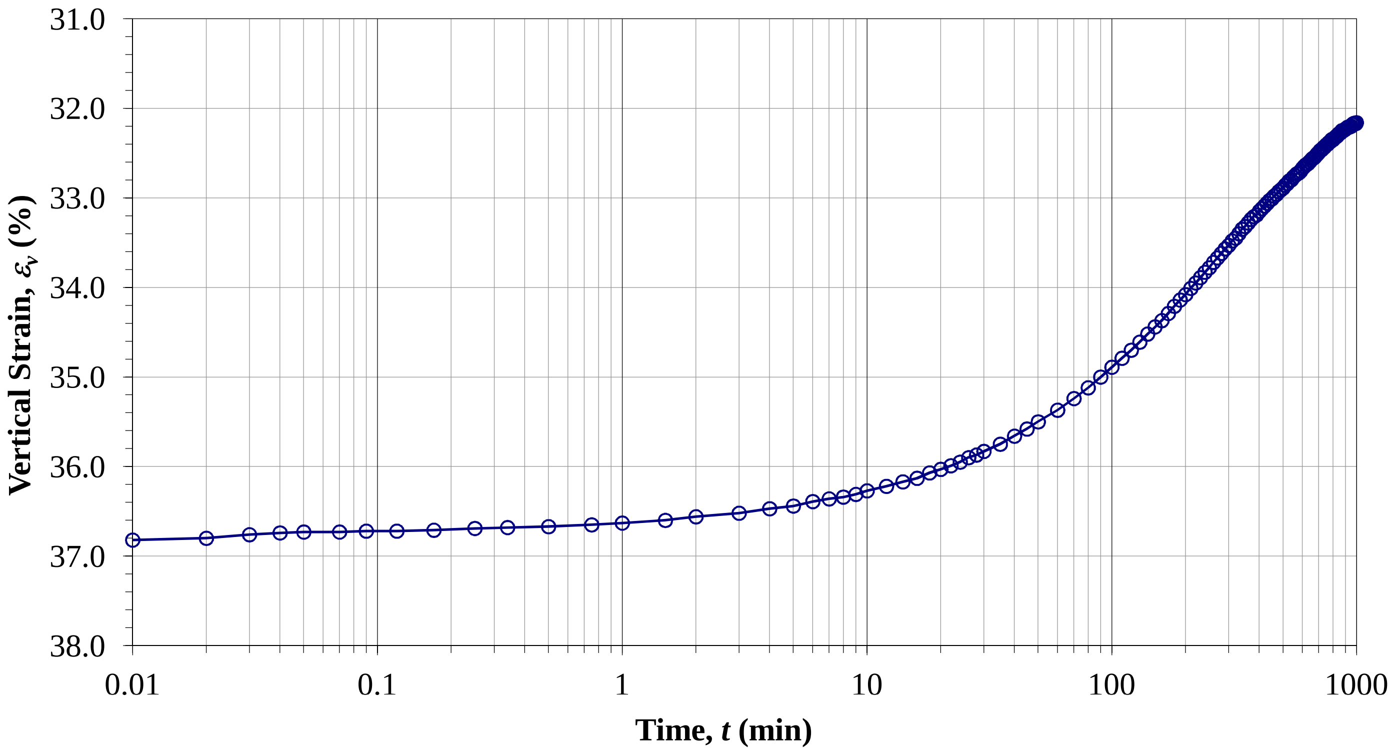
Project: Logan WWTP **Boring No.:** B-05

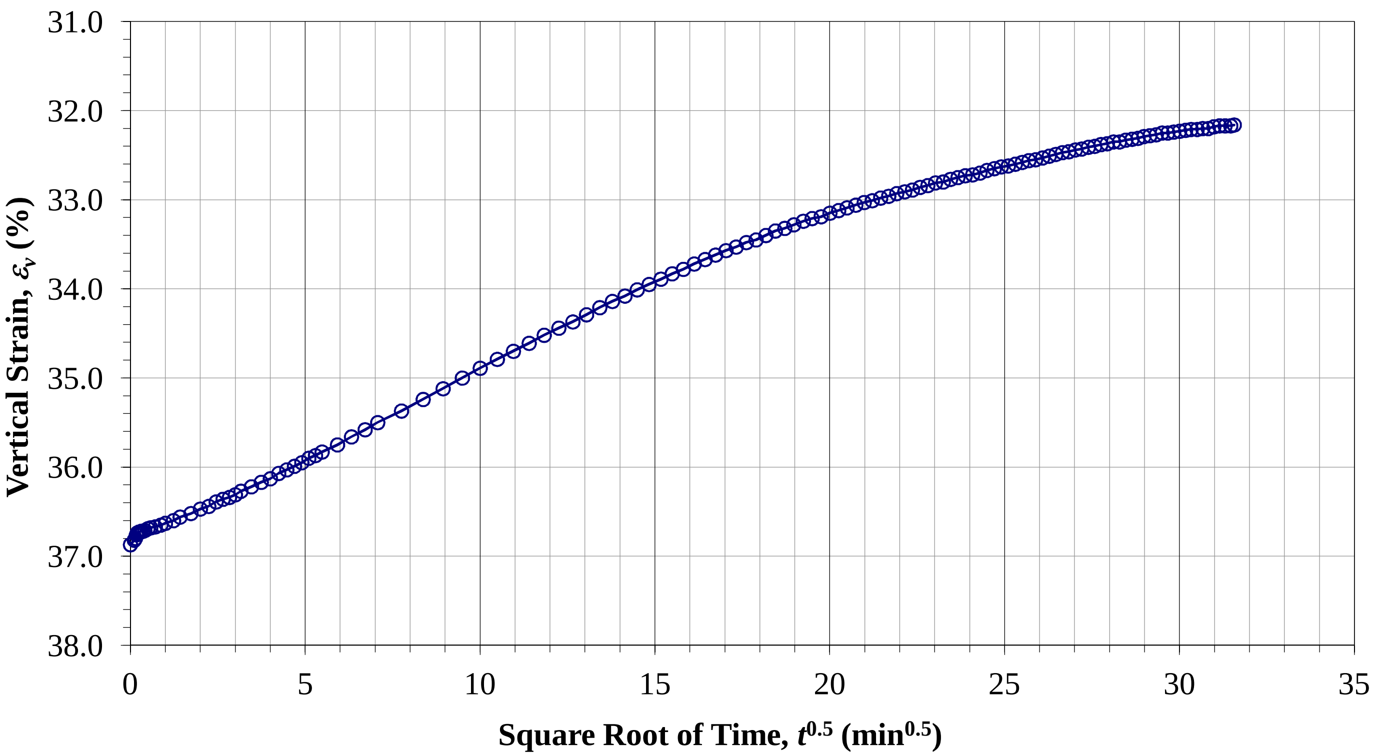
No: 00823-012 **Sample:**

Location: Logan, Utah **Depth:** 19.5'

Constant Load Step: 14 of 14

Stress: 400 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

IGES

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/19/2013
By: MP

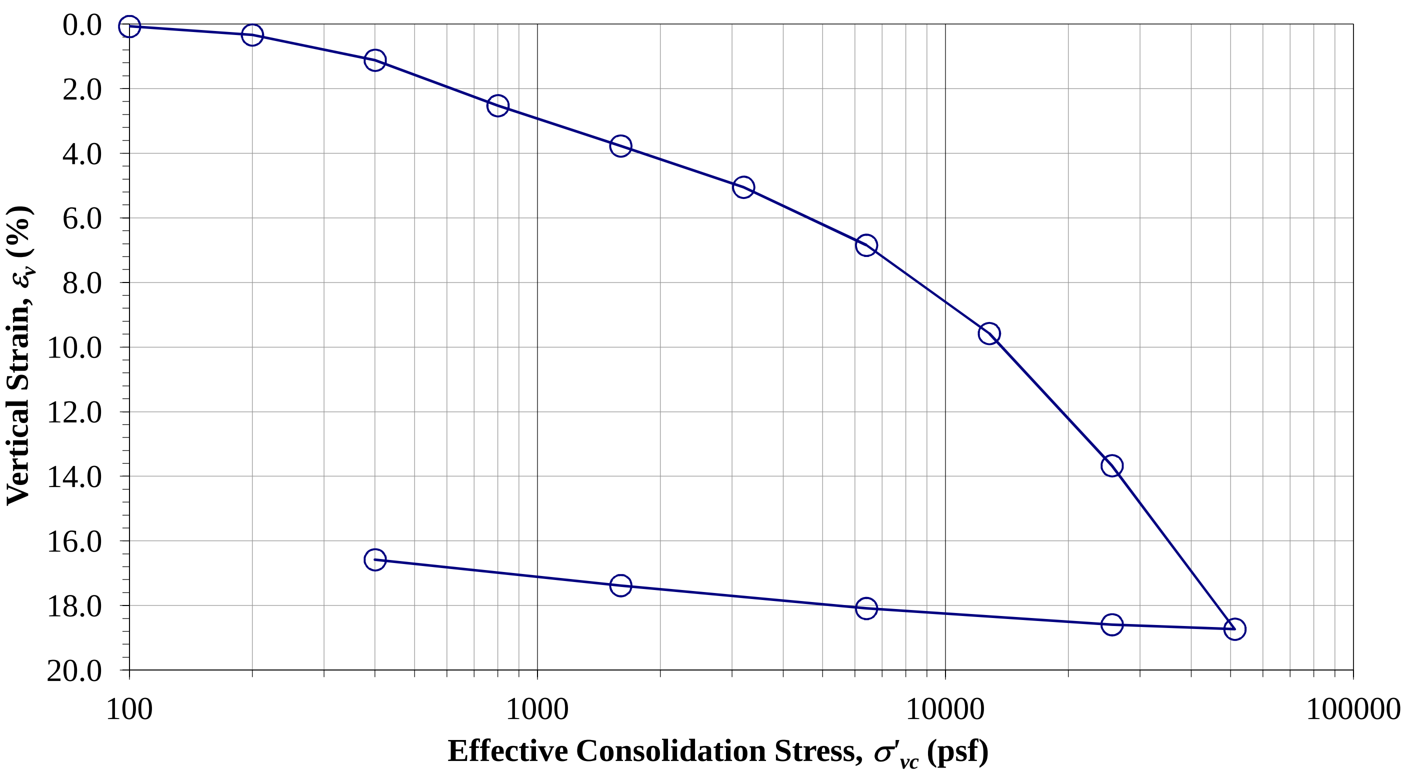
Boring No.: B-05
Sample:
Depth: 24.5'
Sample Description: Grey clay (brittle)
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Test method:	B	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.8342
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	178.11	175.19
Wt. rings/tare (g)	42.72	42.72
Total unit wt., γ (pcf)	112.5	132.0
Wet soil + tare (g)	446.42	
Dry soil + tare (g)	374.27	
Tare (g)	121.55	
Water content, ω (%)	28.5	25.8
Dry unit wt., γ_d (pcf)	87.5	104.9
Saturation, S	0.84	1.00

*Note: C_v, C_c, C_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0000	0.00	1.0000	0.9045
100	0.0007	0.07	0.9993	0.9031
200	0.0033	0.33	0.9967	0.8981
400	0.0112	1.12	0.9888	0.8832
800	0.0252	2.52	0.9748	0.8564
1600	0.0377	3.77	0.9623	0.8327
3200	0.0505	5.05	0.9495	0.8084
6400	0.0685	6.85	0.9315	0.7741
12800	0.0958	9.58	0.9042	0.7221
25600	0.1367	13.67	0.8633	0.6441
51200	0.1873	18.73	0.8127	0.5478
25600	0.1859	18.59	0.8141	0.5504
6400	0.1809	18.09	0.8191	0.5600
1600	0.1738	17.38	0.8262	0.5735
400	0.1658	16.58	0.8342	0.5887



Entered: ________
Reviewed: ________

One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP

No: 00823-012

Location: Logan, Utah

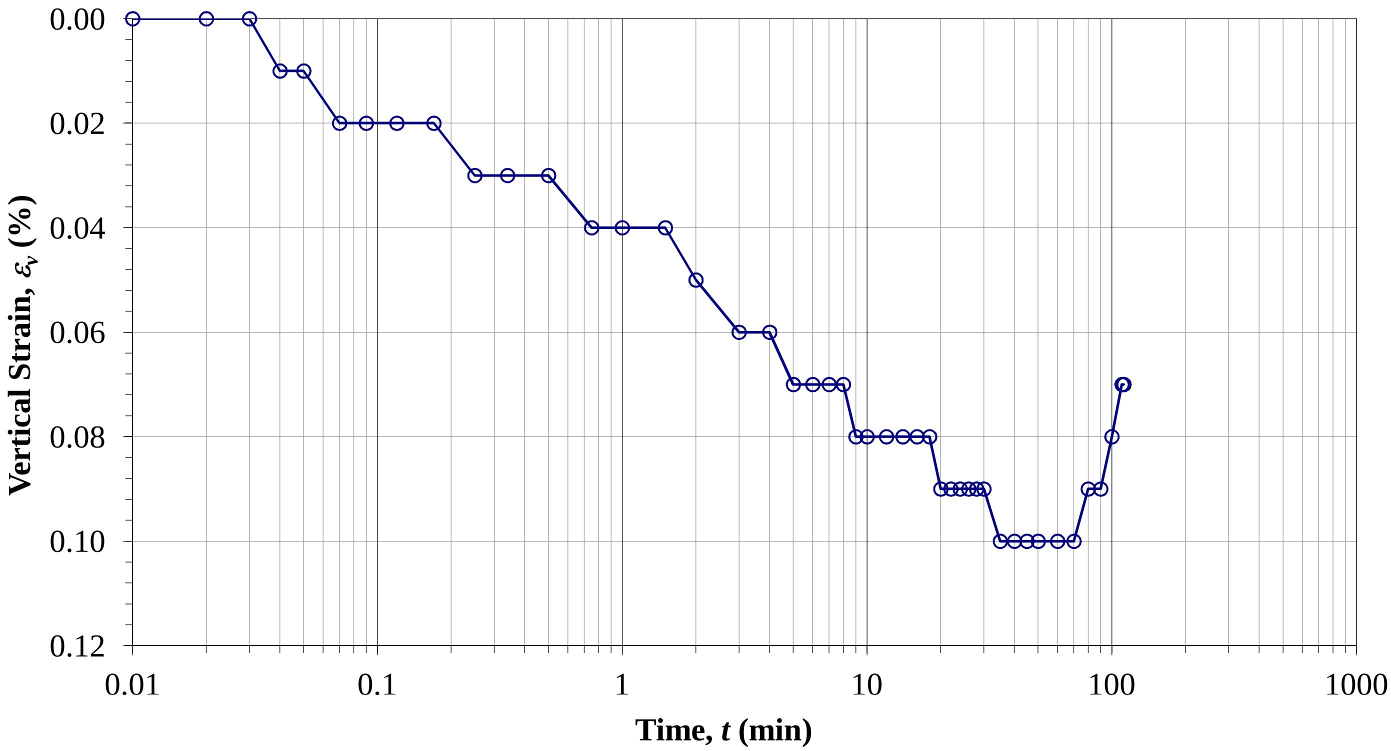
Boring No.: B-05

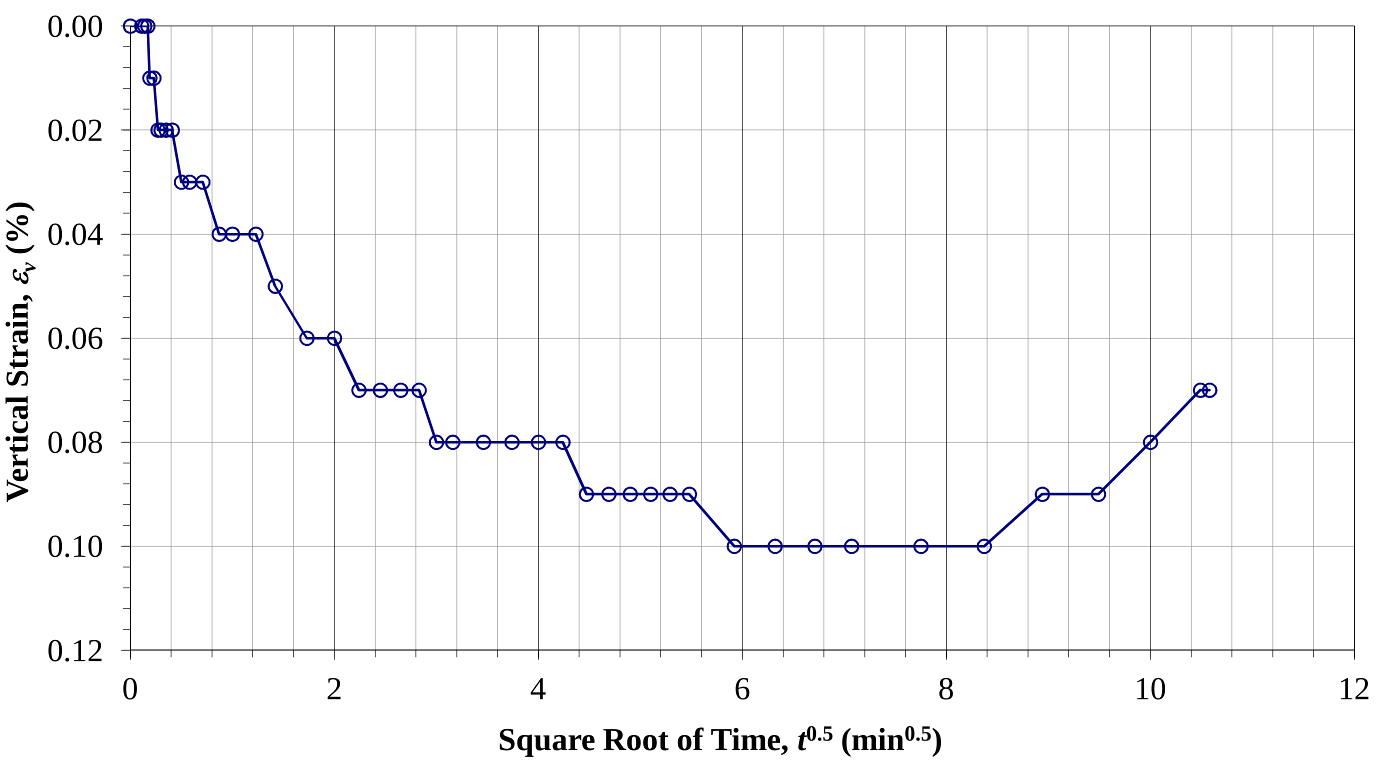
Sample:

Depth: 24.5'

Constant Load Step: 1 of 14

Stress: 100 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP

No: 00823-012

Location: Logan, Utah

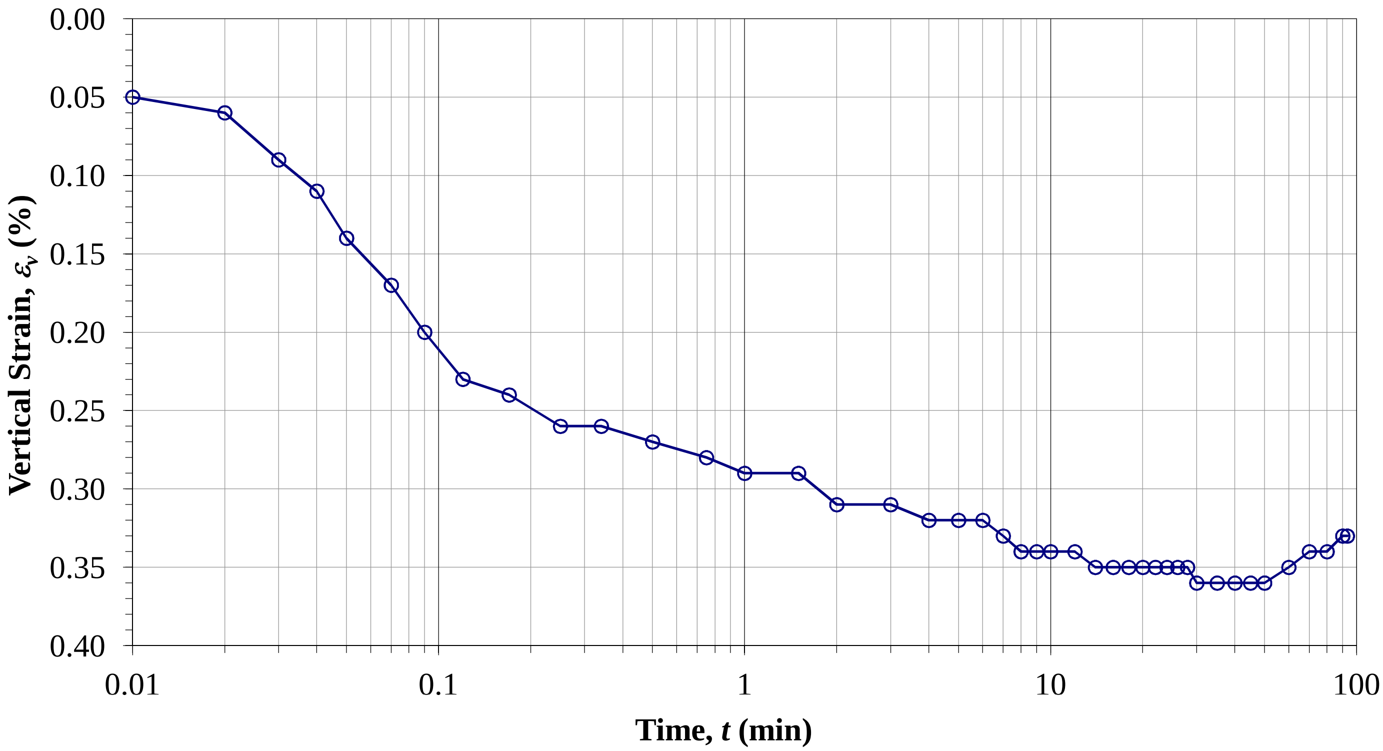
Boring No.: B-05

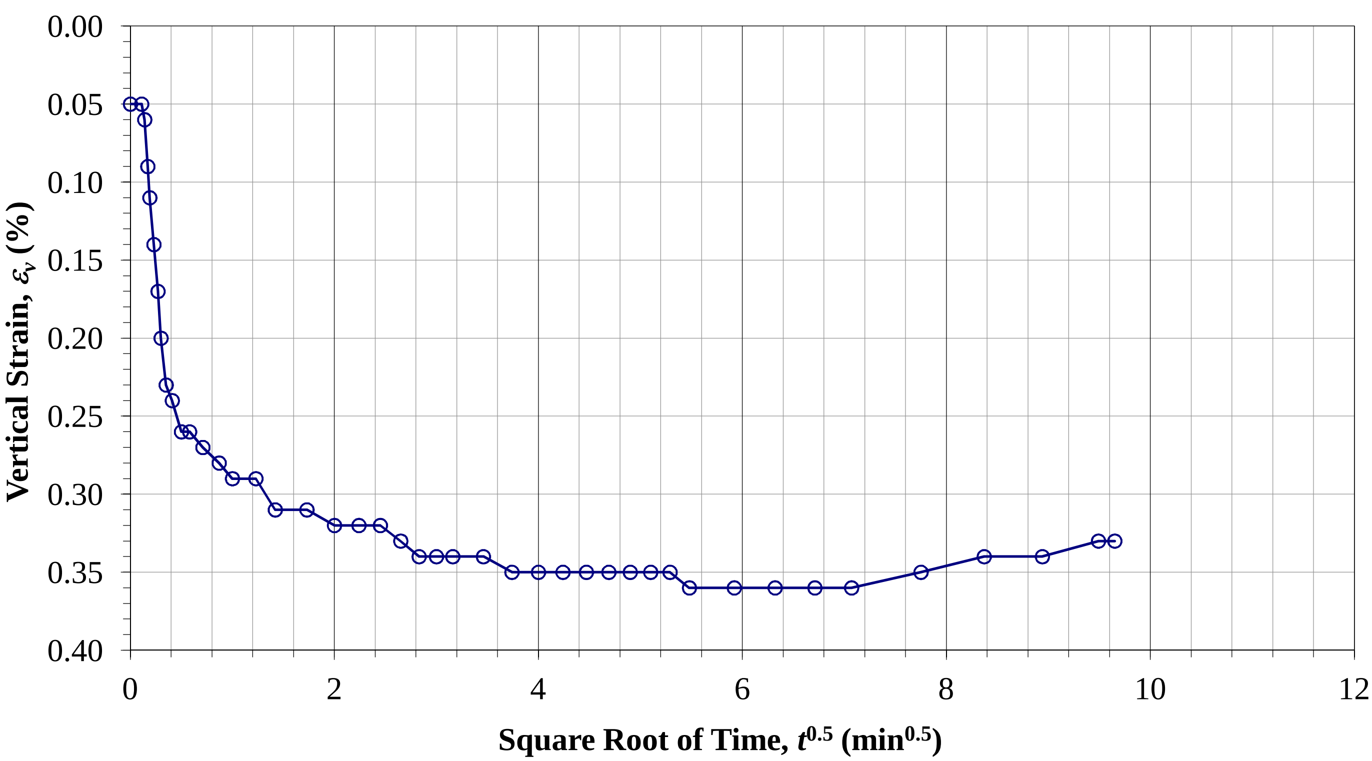
Sample:

Depth: 24.5'

Constant Load Step: 2 of 14

Stress: 200 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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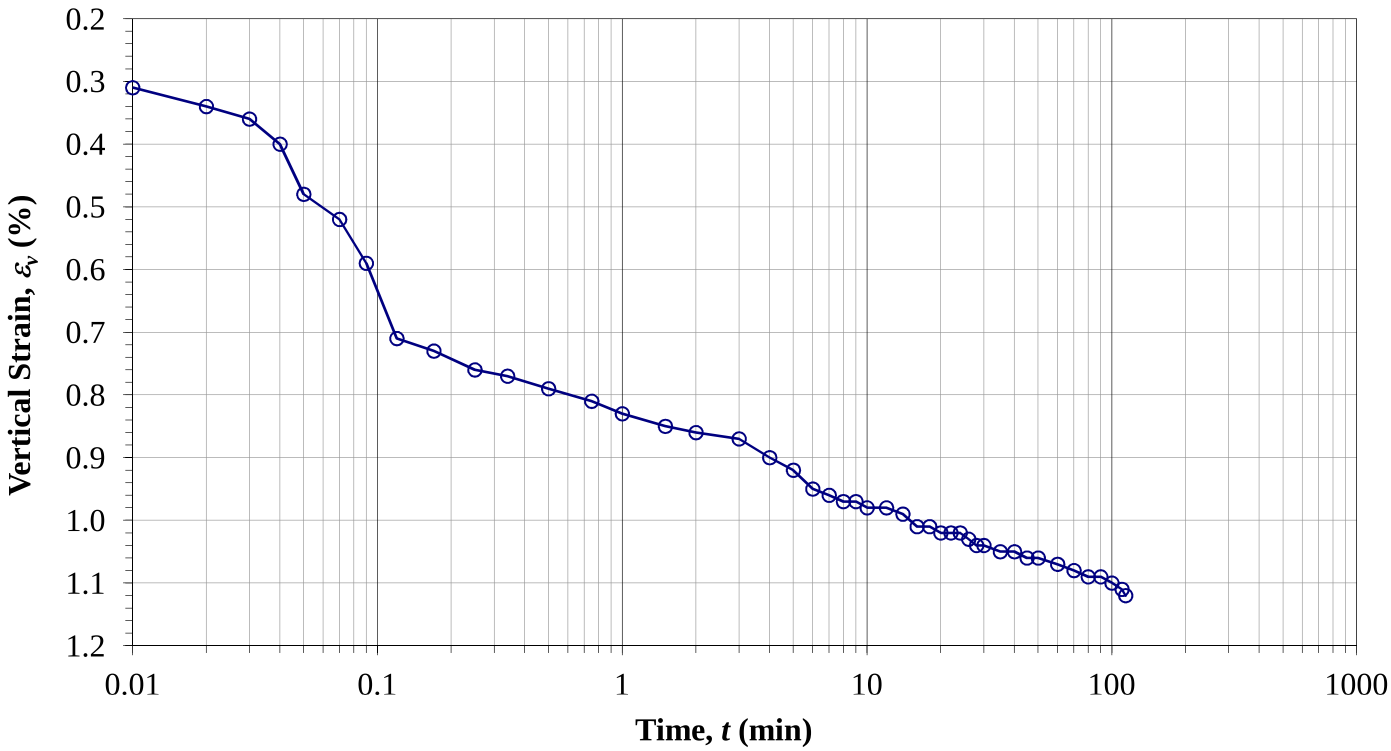
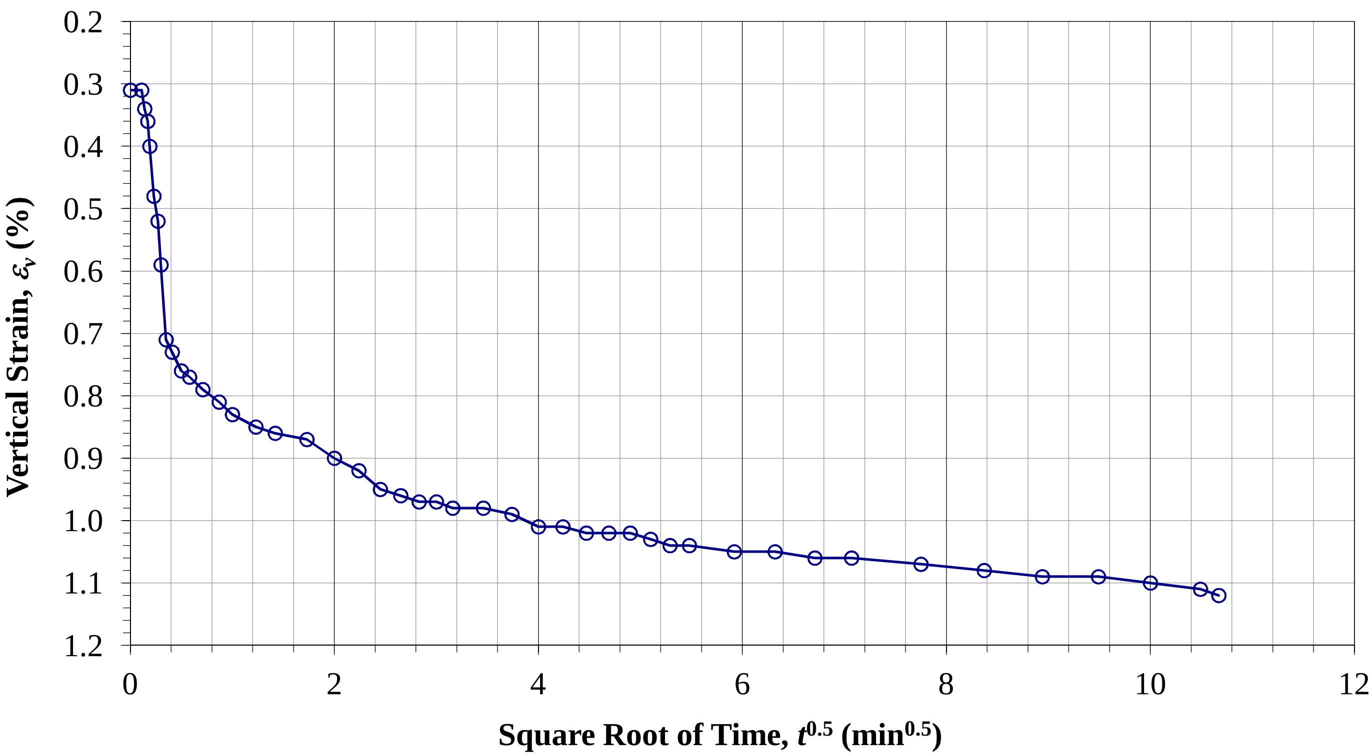
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 24.5'

Constant Load Step: 3 of 14
Stress: 400 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

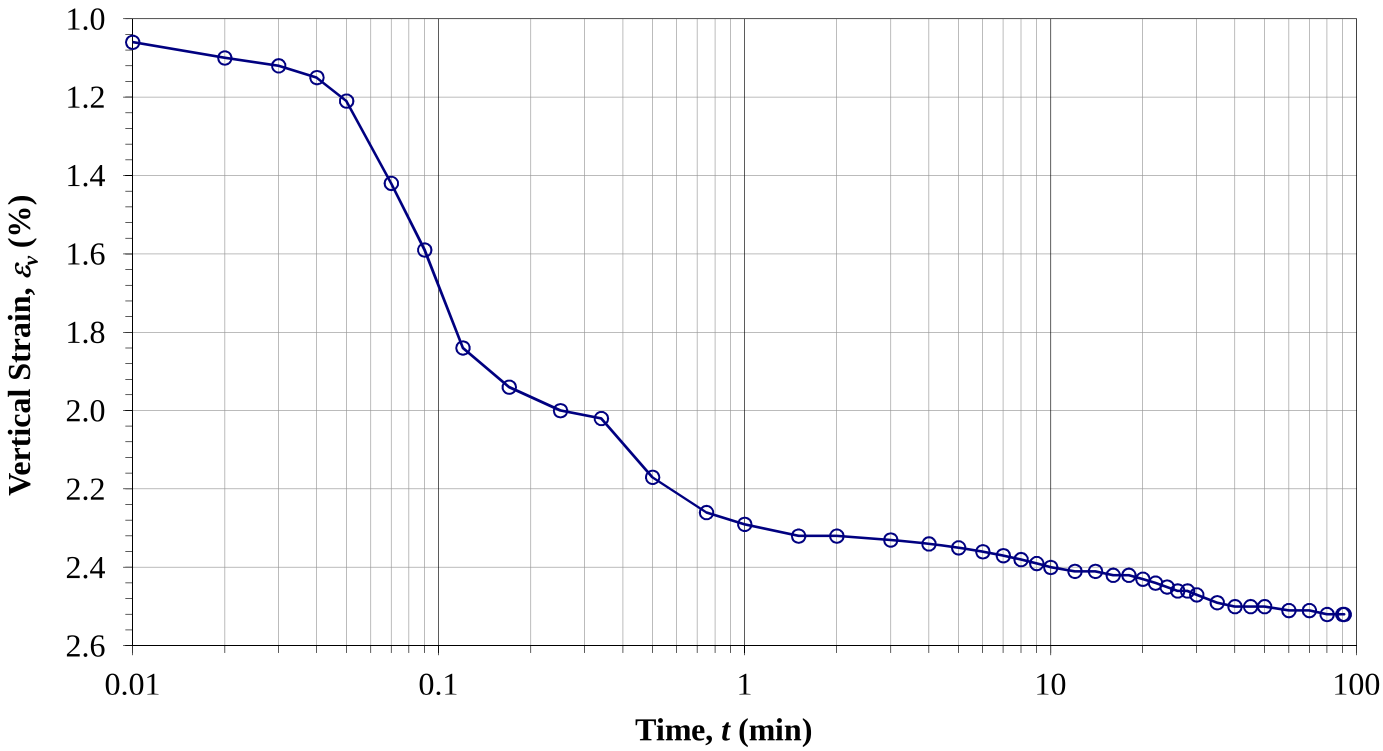
Project: **Logan WWTP** **Boring No.:** **B-05**

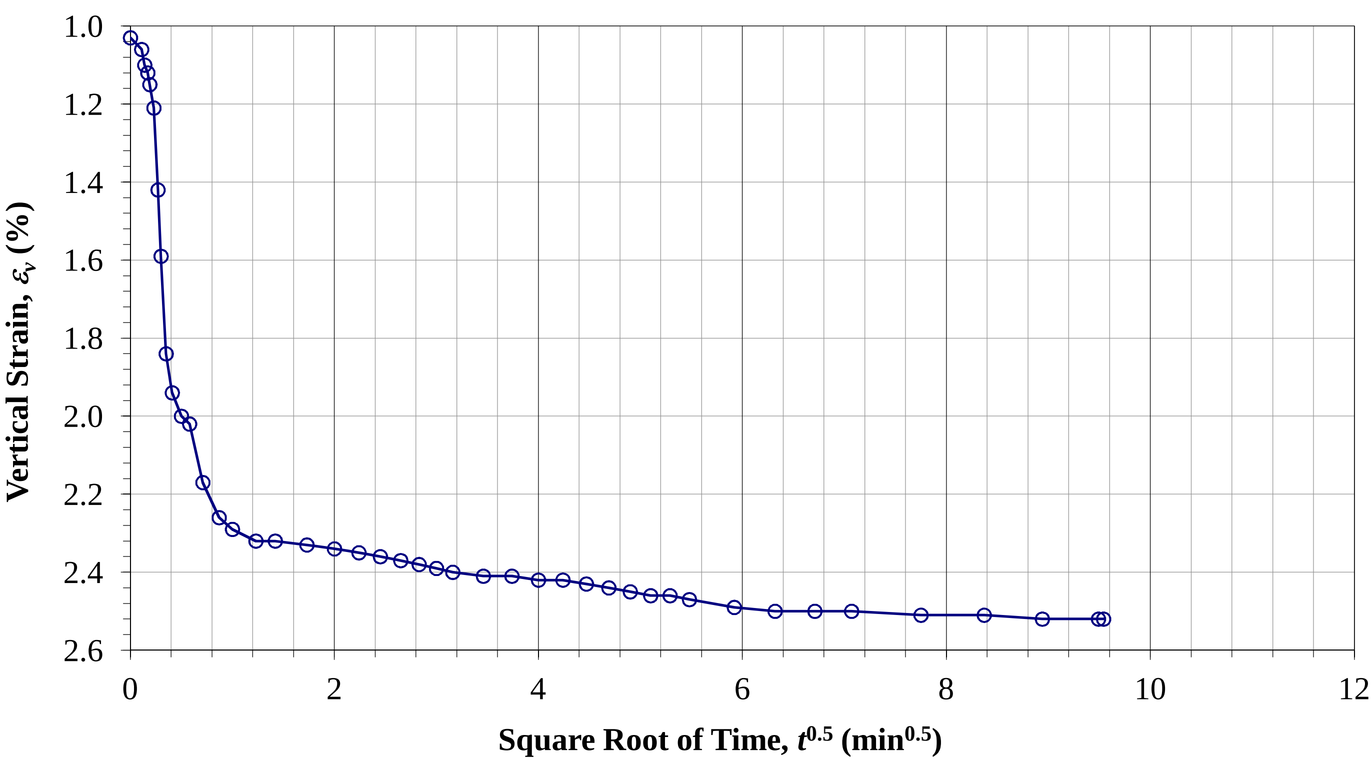
No: **00823-012** **Sample:**

Location: Logan, Utah **Depth:** **24.5'**

Constant Load Step: 4 of 14

Stress: 800 psf



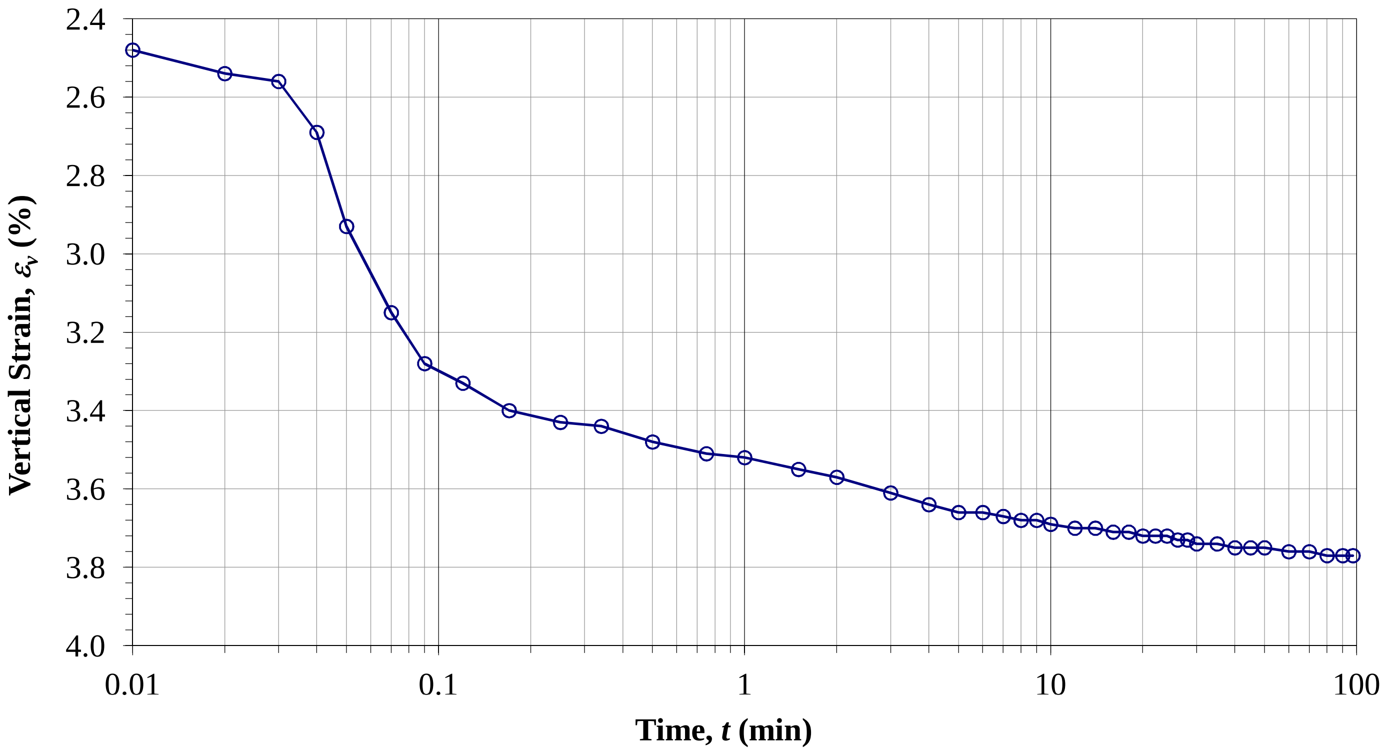


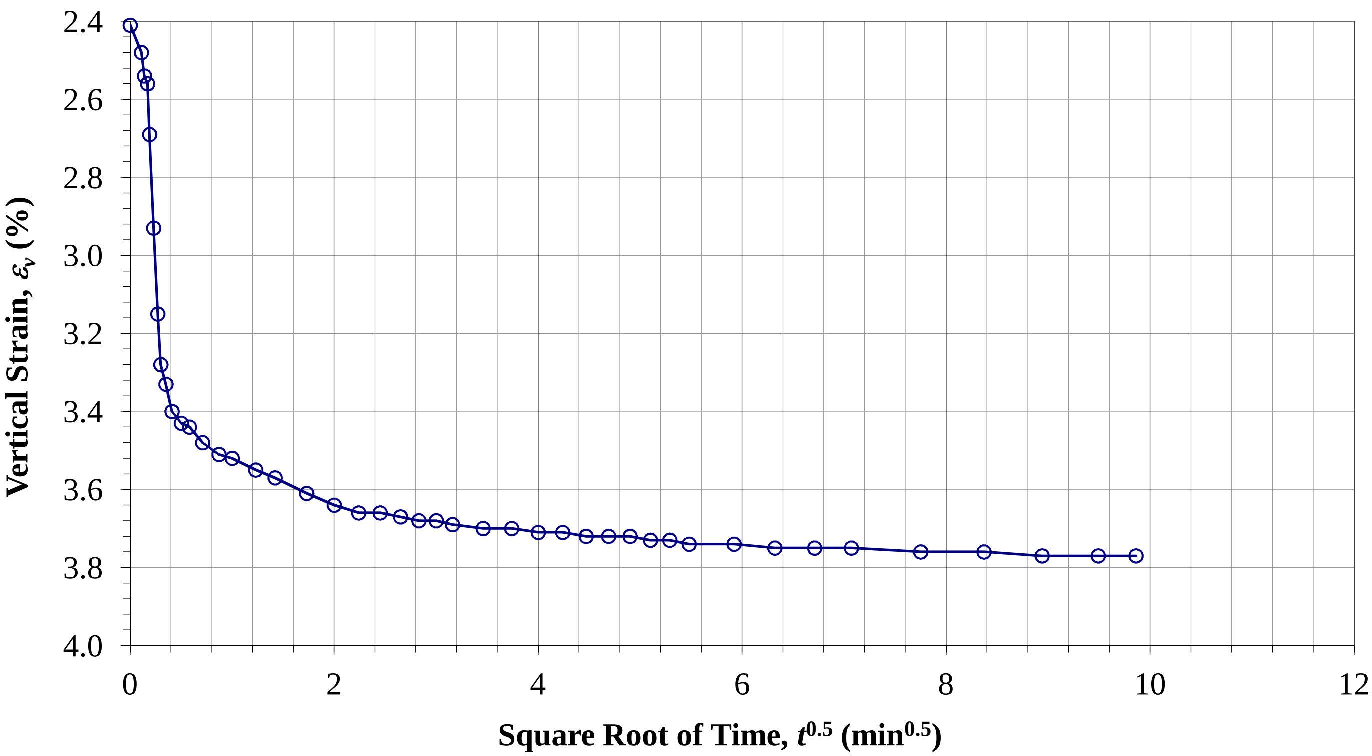
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah

Boring No.: **B-05**
Sample:
Depth: **24.5'**

Constant Load Step: 5 of 14
Stress: 1600 psf



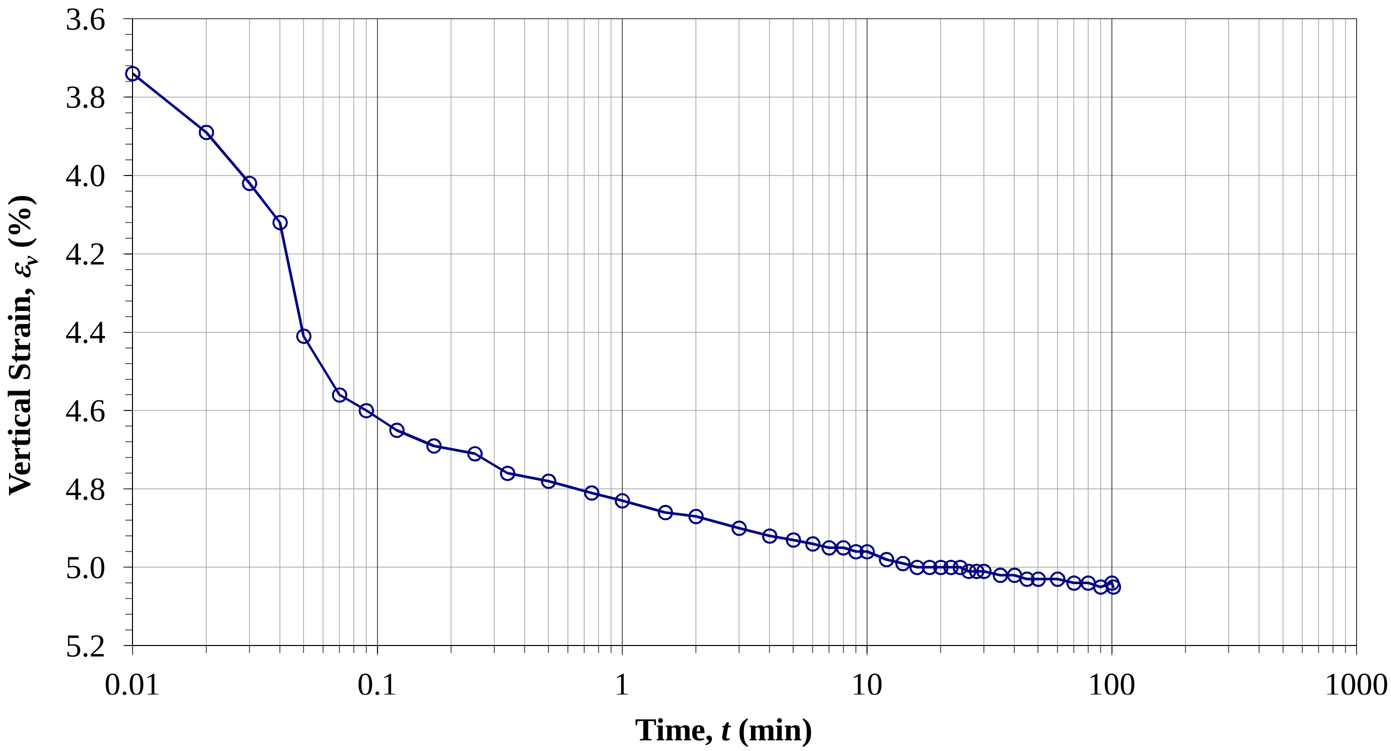


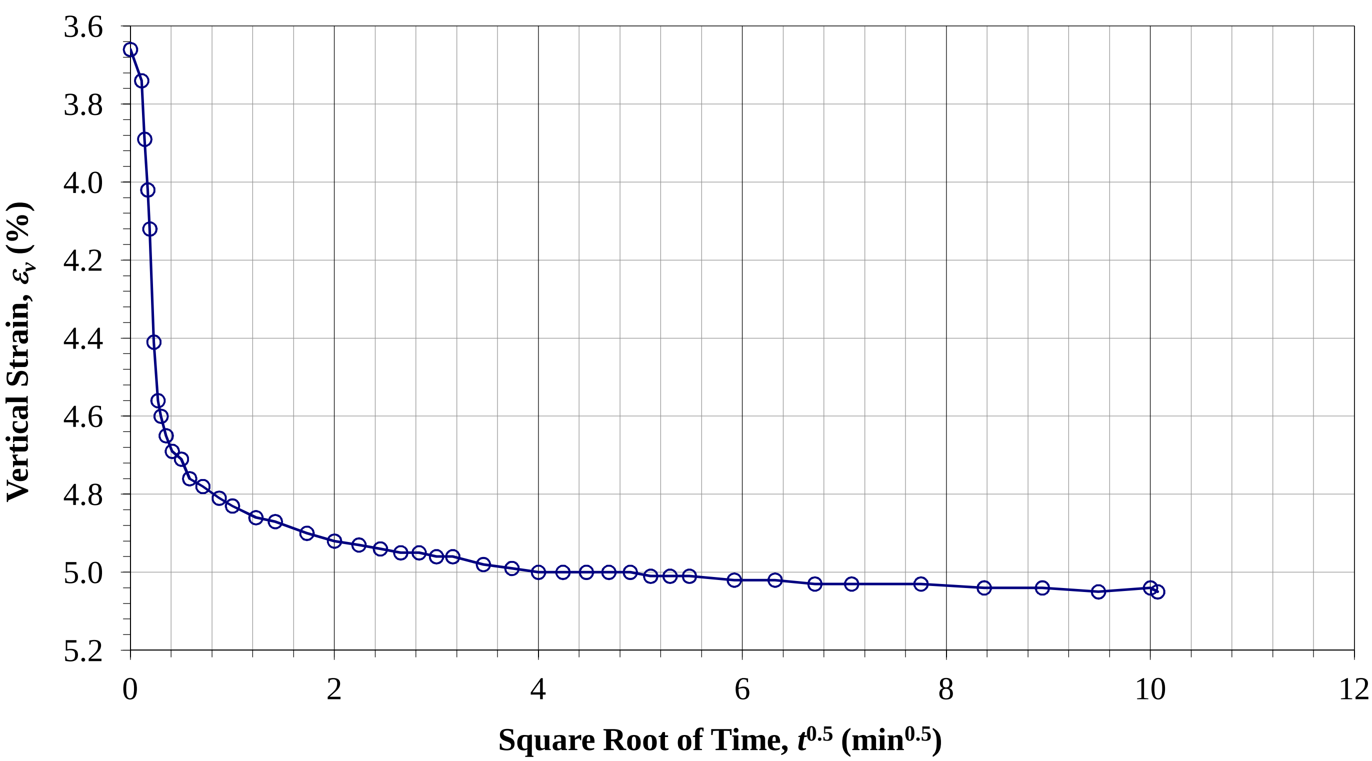
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 24.5'

Constant Load Step: 6 of 14
Stress: 3200 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

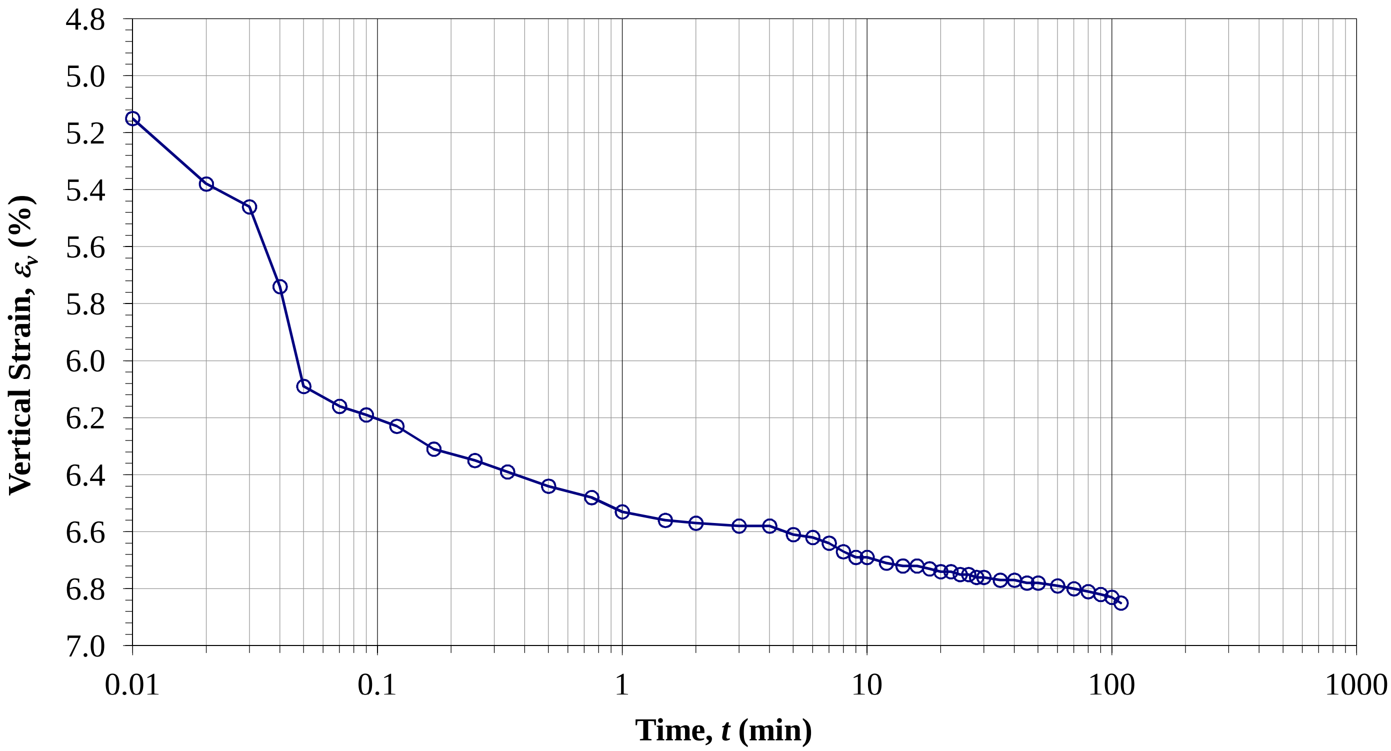
Project: **Logan WWTP** | **Boring No.:** **B-05**

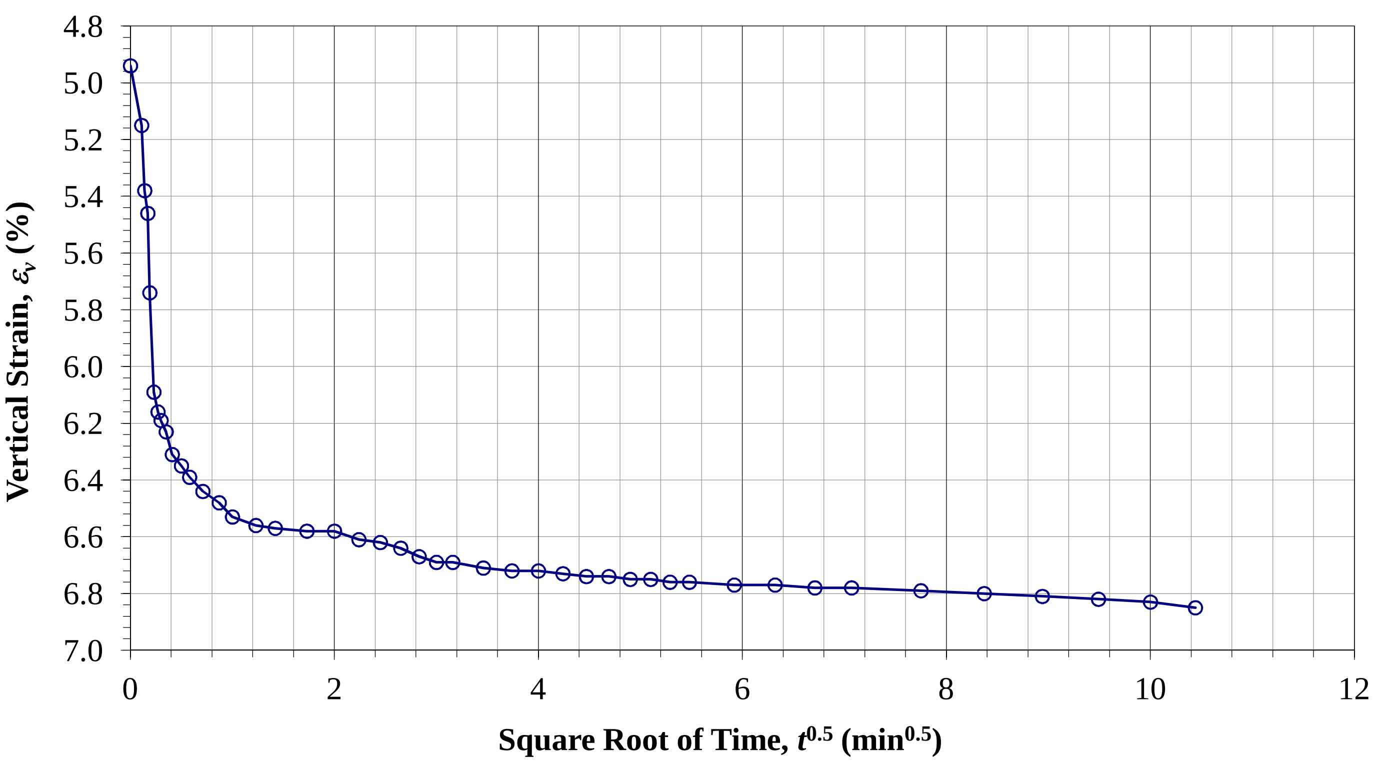
No: **00823-012** | **Sample:**

Location: Logan, Utah | **Depth:** **24.5'**

Constant Load Step: 7 of 14

Stress: 6400 psf



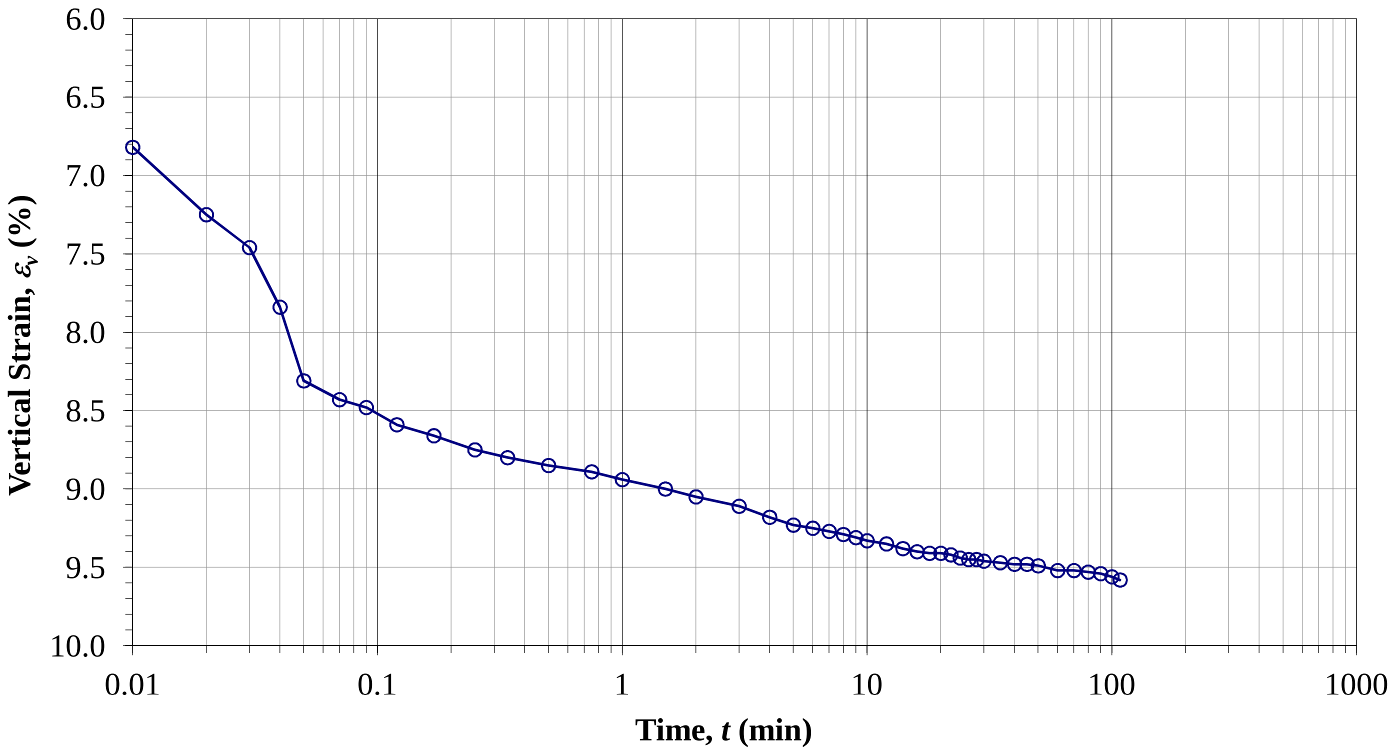


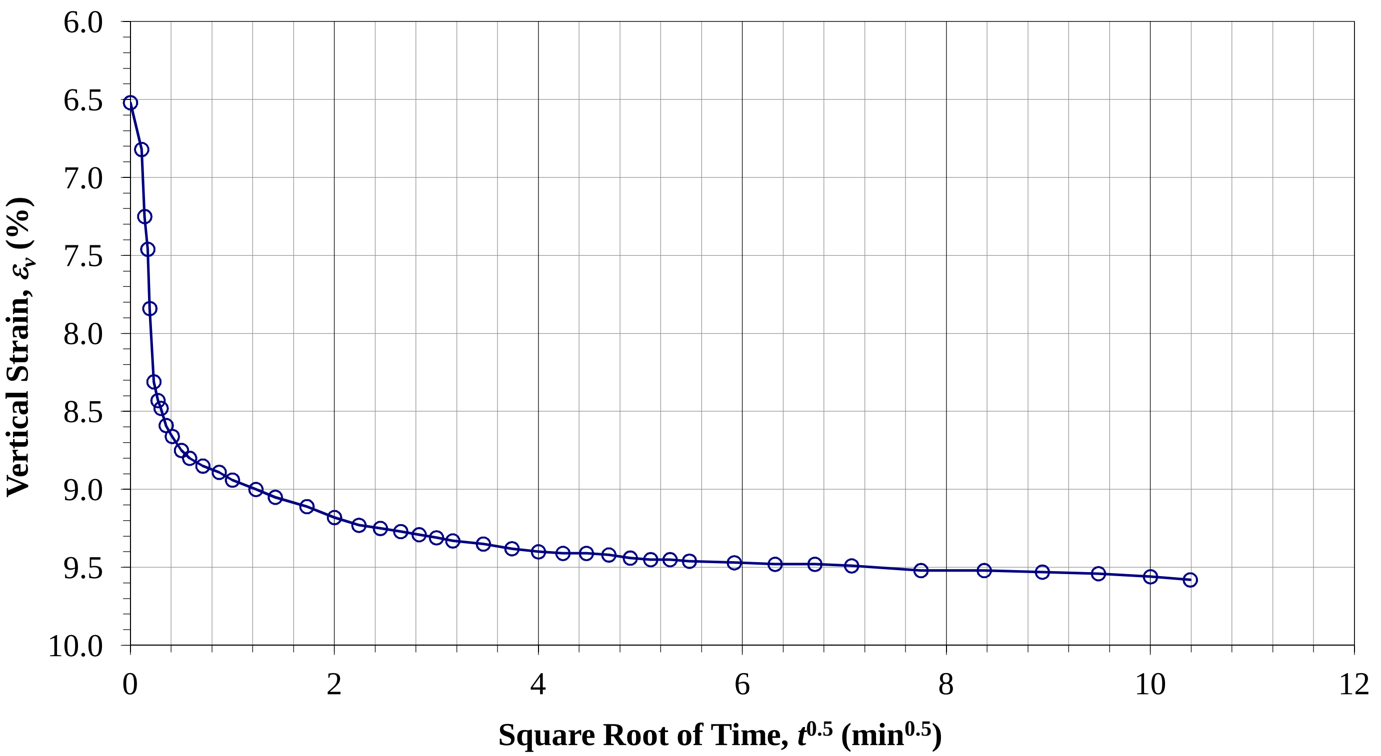
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 24.5'

Constant Load Step: 8 of 14
Stress: 12800 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP

No: 00823-012

Location: Logan, Utah

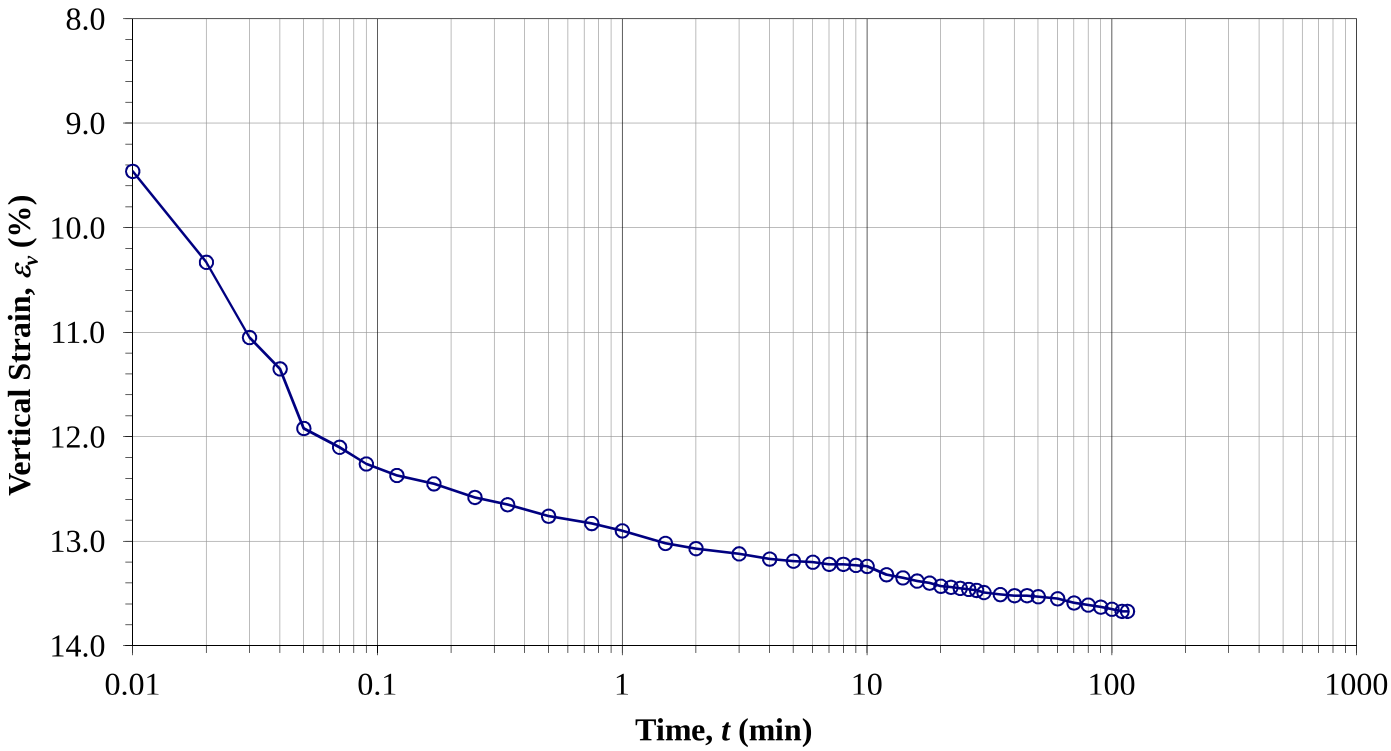
Boring No.: B-05

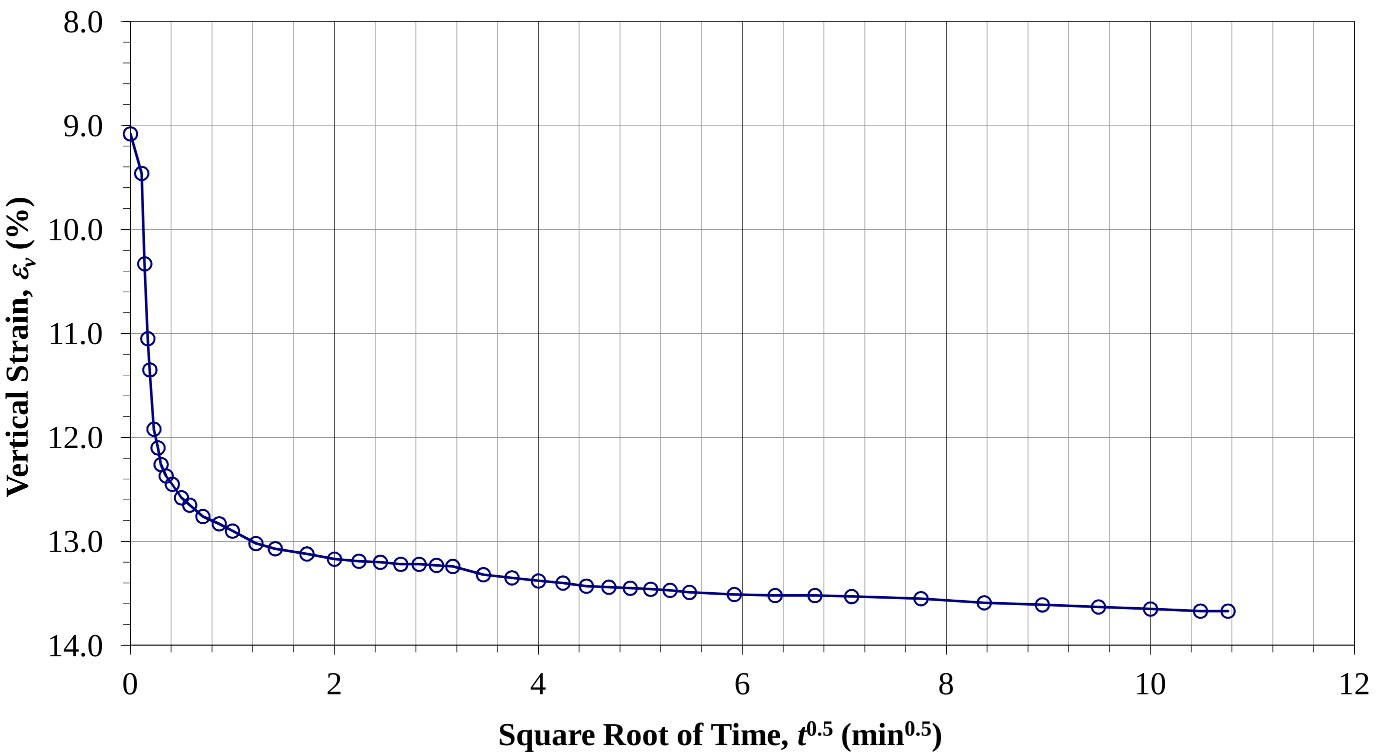
Sample:

Depth: 24.5'

Constant Load Step: 9 of 14

Stress: 25600 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

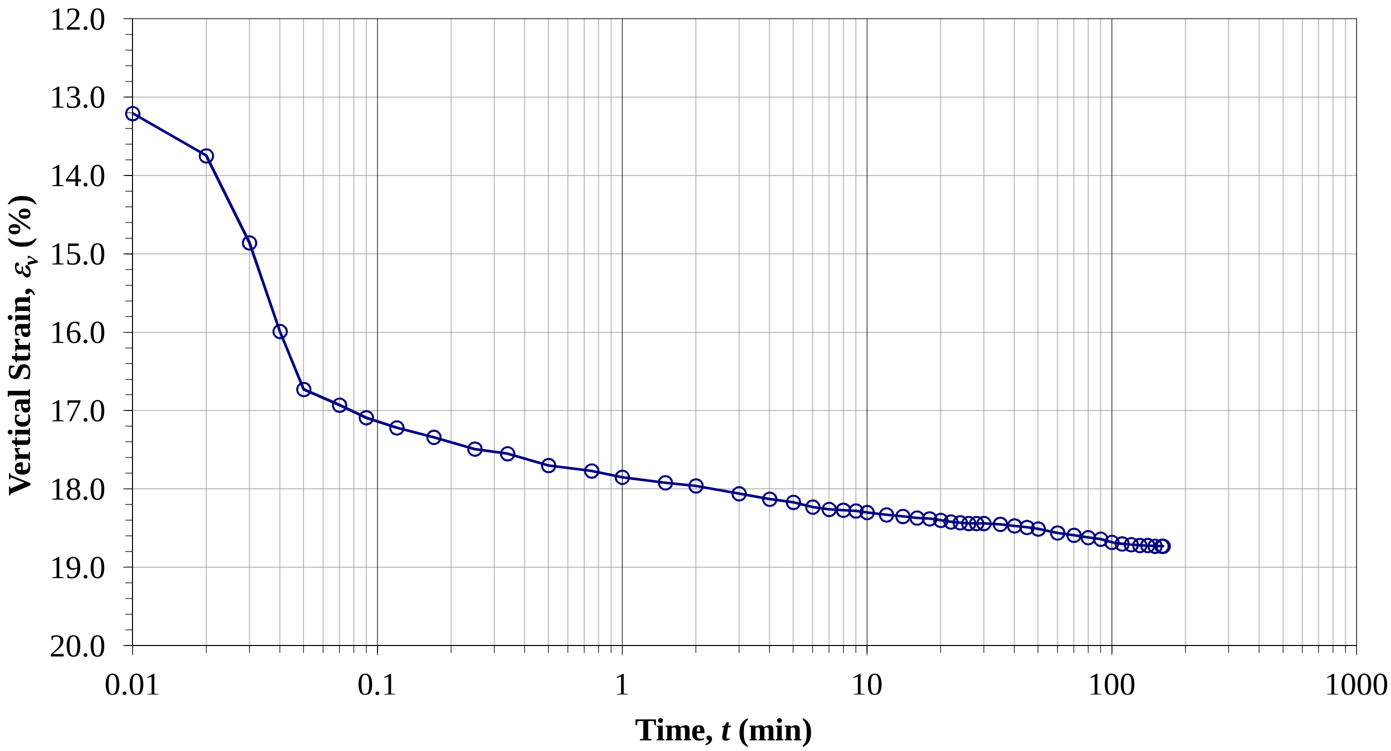
Project: **Logan WWTP** **Boring No.:** **B-05**

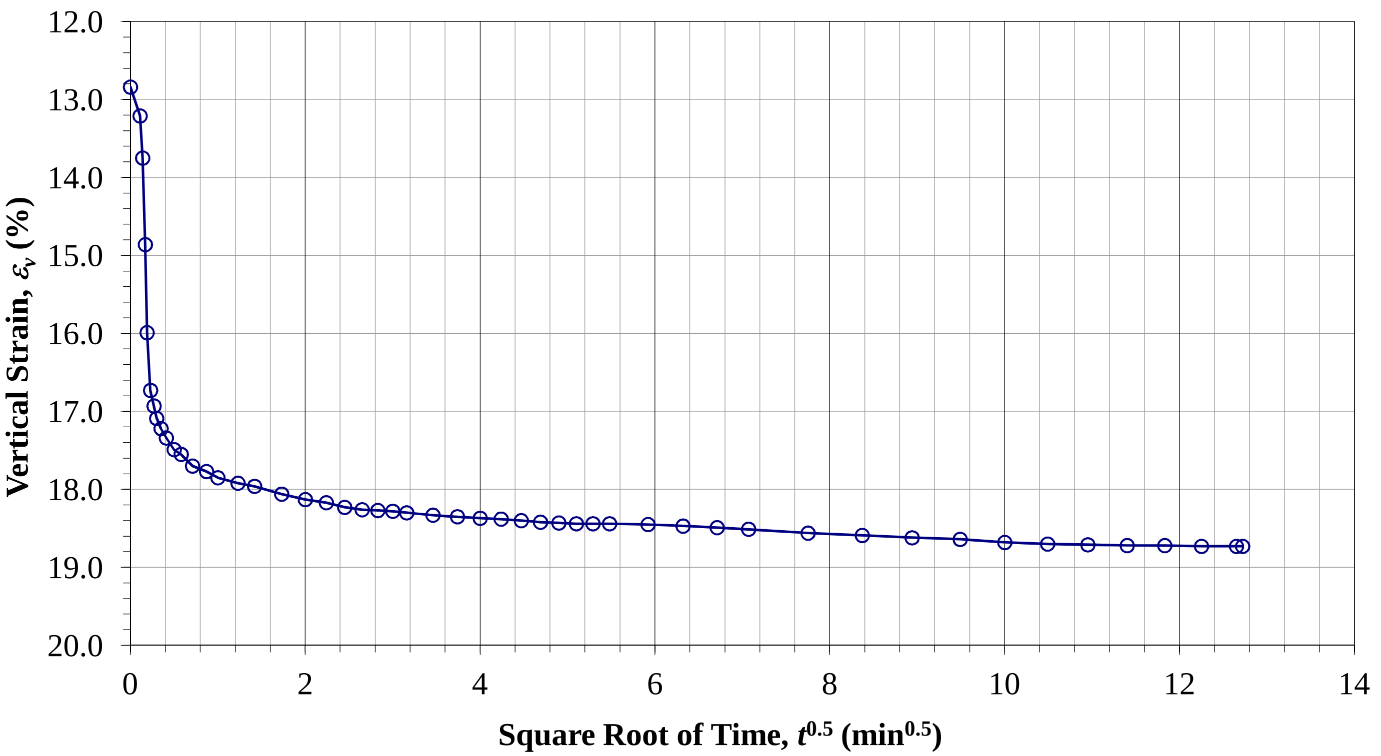
No: **00823-012** **Sample:**

Location: Logan, Utah **Depth:** **24.5'**

Constant Load Step: 10 of 14

Stress: 51200 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP

No: 00823-012

Location: Logan, Utah

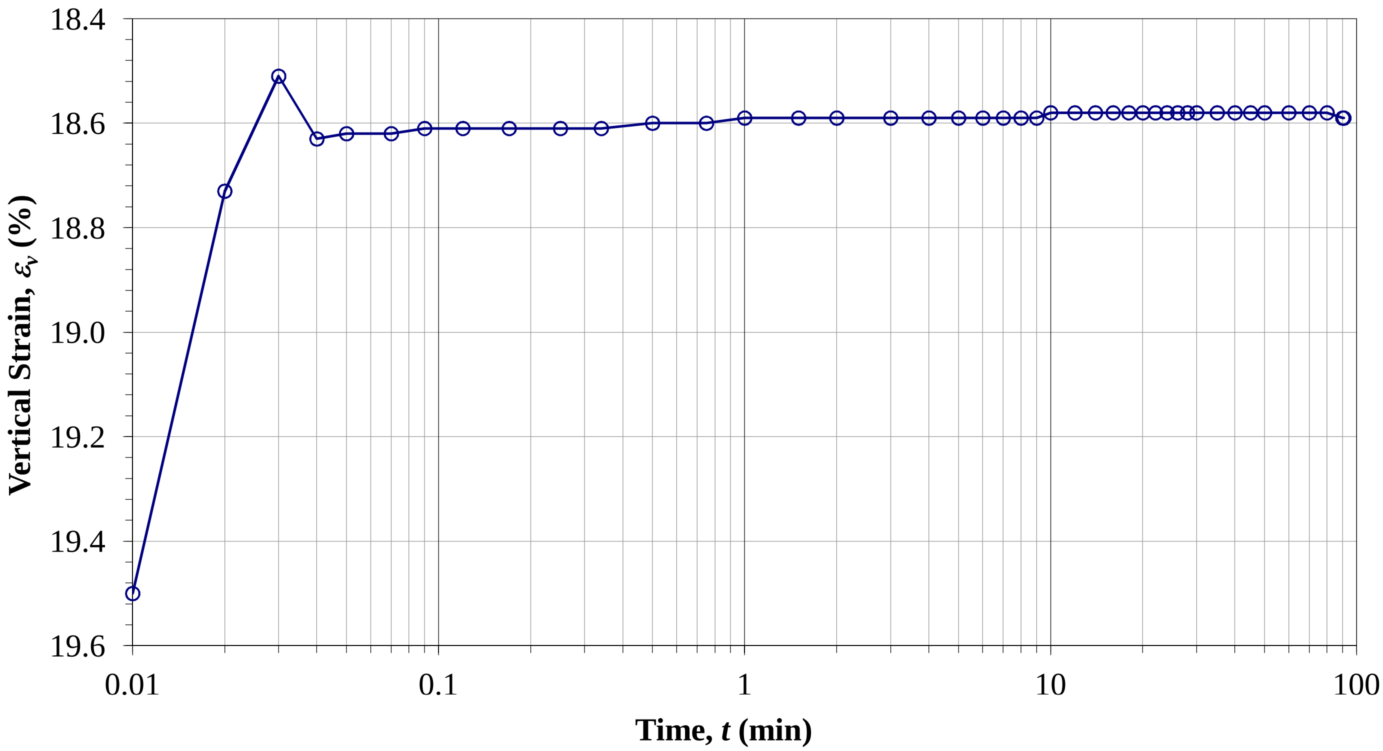
Boring No.: B-05

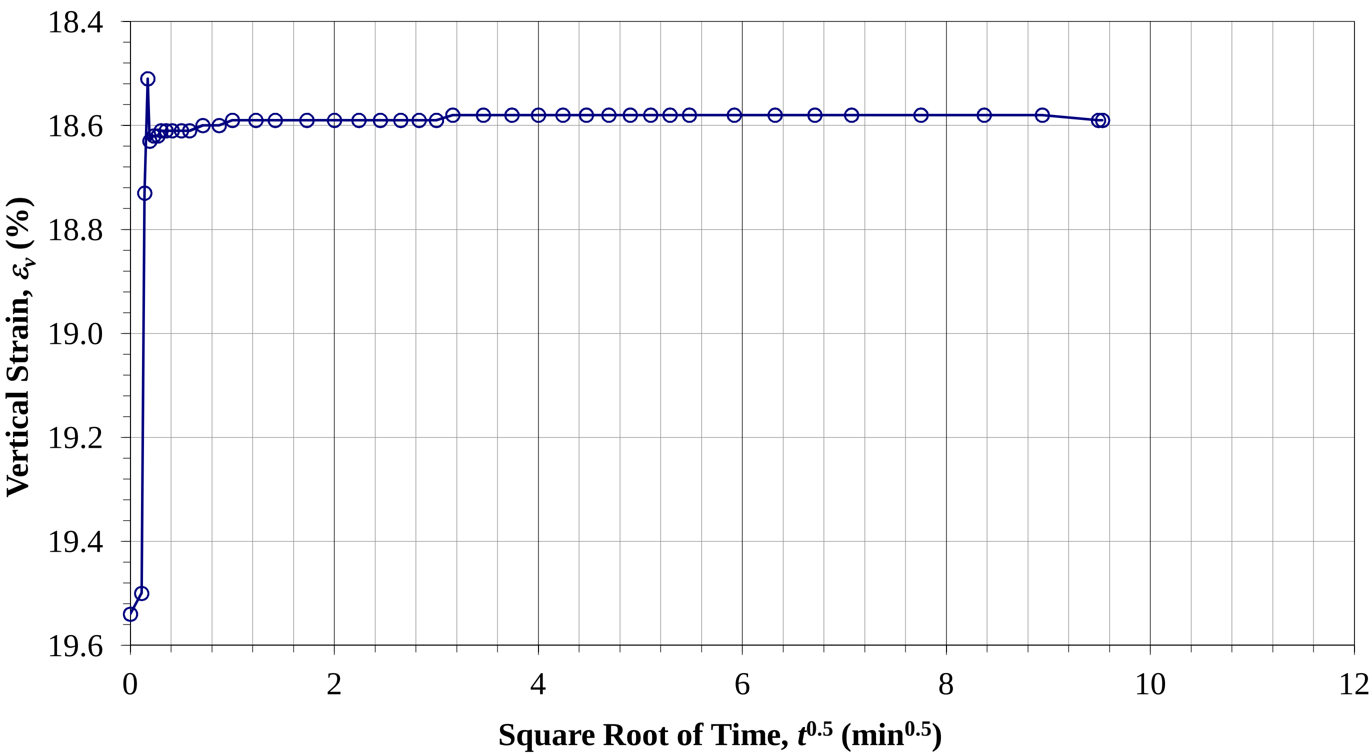
Sample:

Depth: 24.5'

Constant Load Step: 11 of 14

Stress: 25600 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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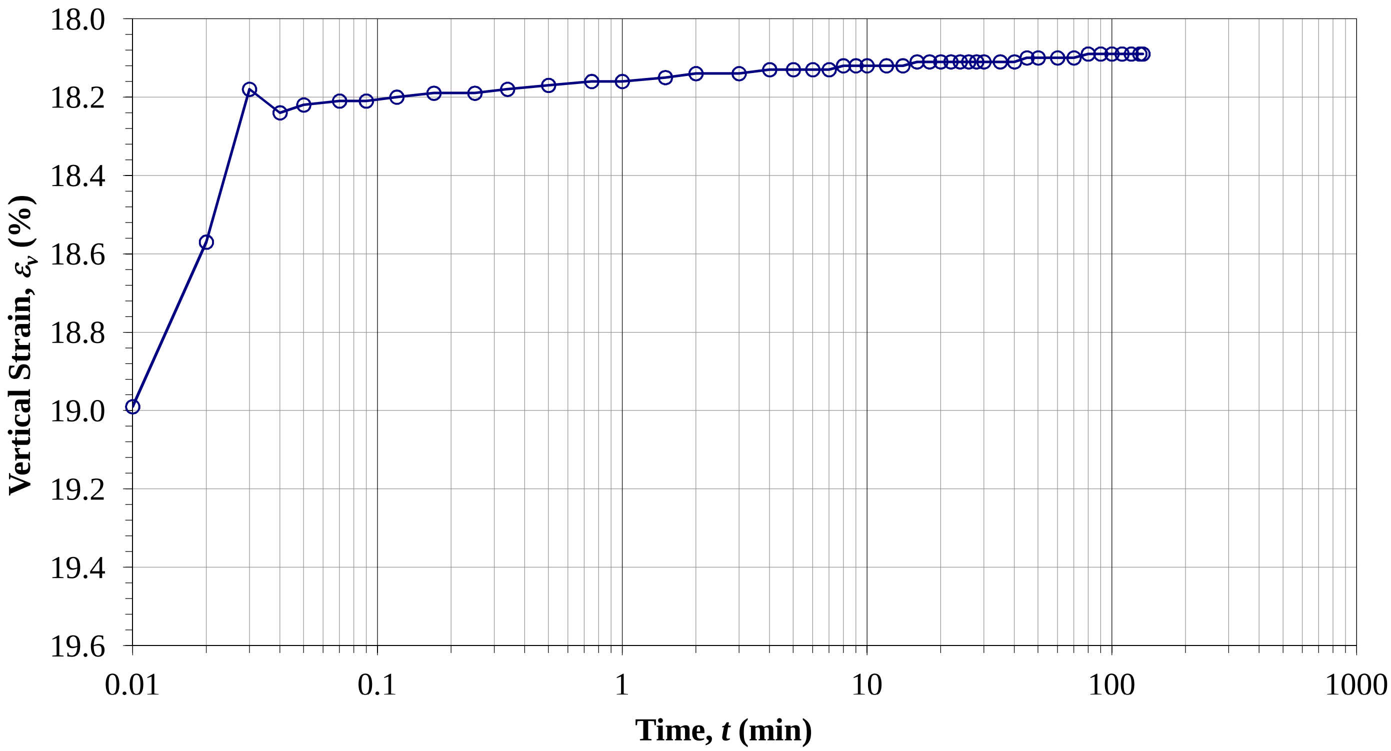
Project: **Logan WWTP** **Boring No.:** **B-05**

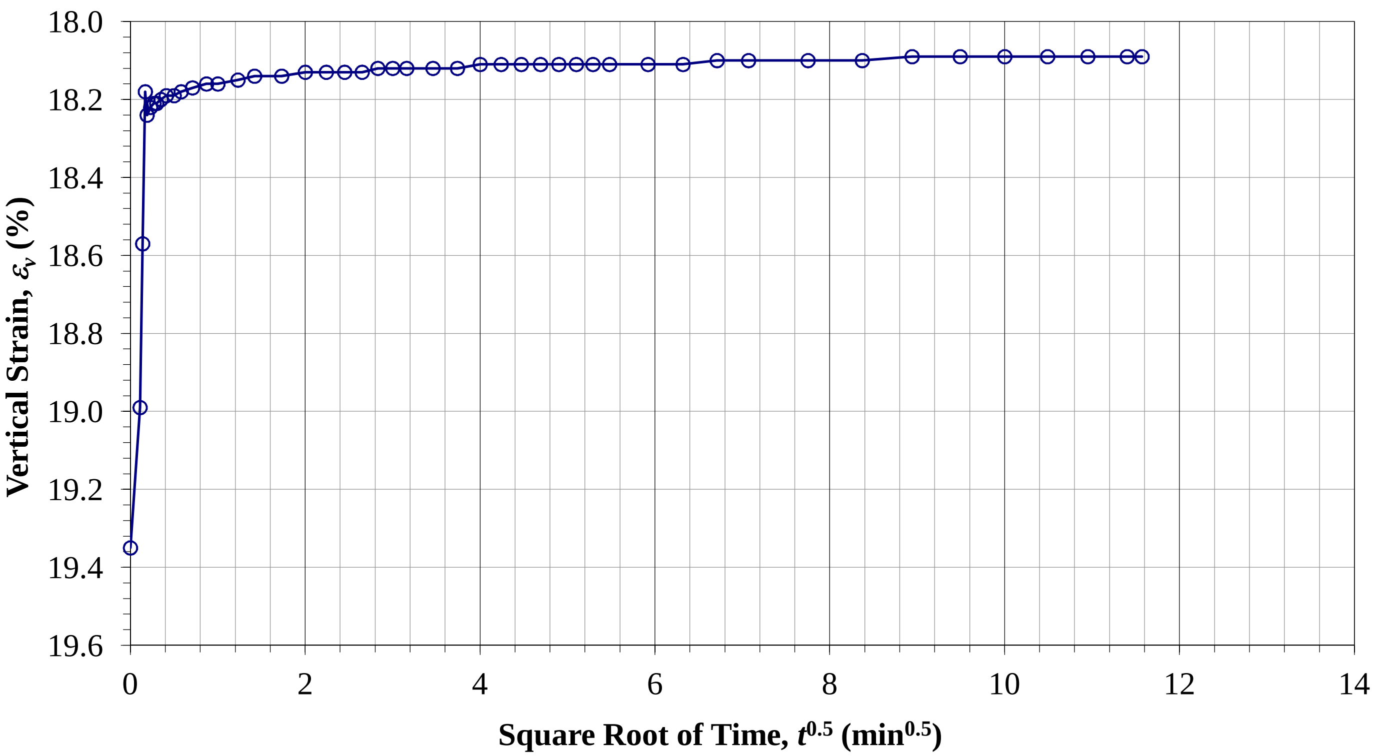
No: **00823-012** **Sample:**

Location: Logan, Utah **Depth:** **24.5'**

Constant Load Step: 12 of 14

Stress: 6400 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

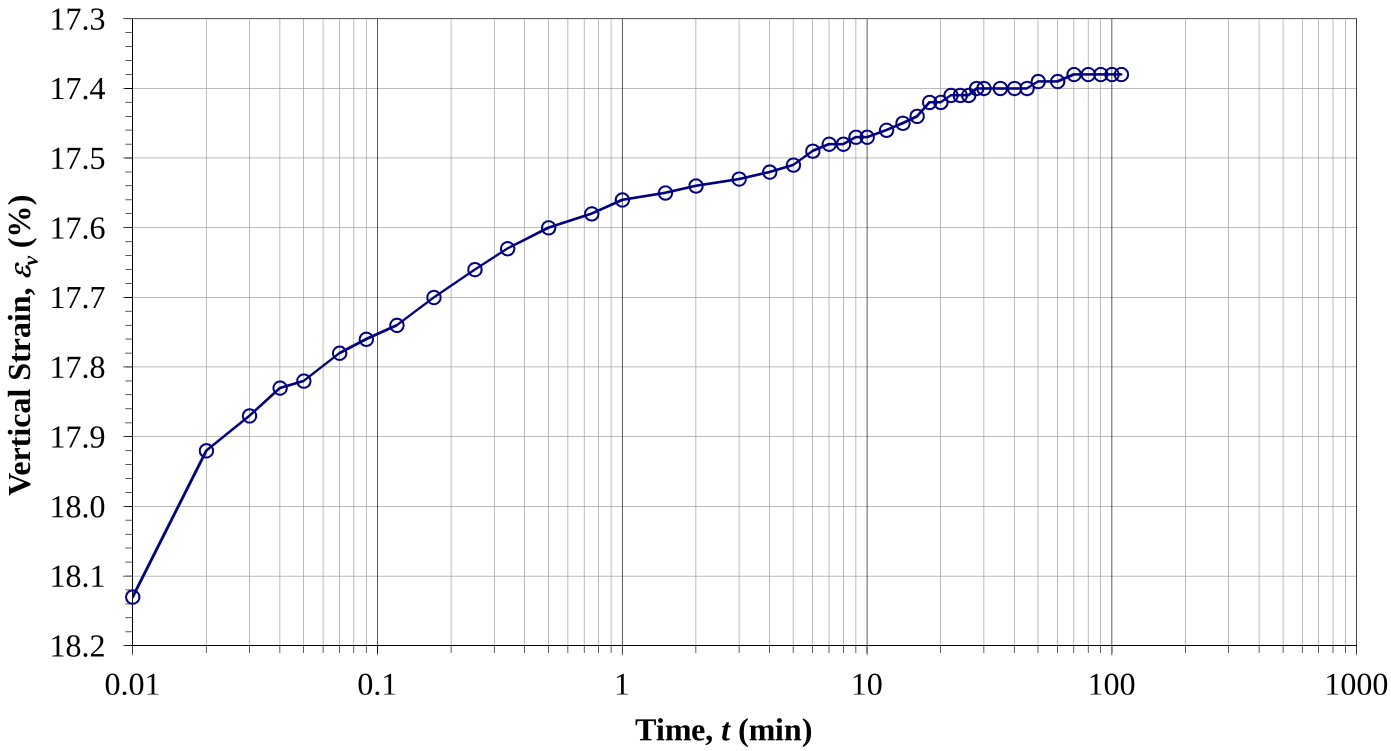
Project: Logan WWTP **Boring No.:** B-05

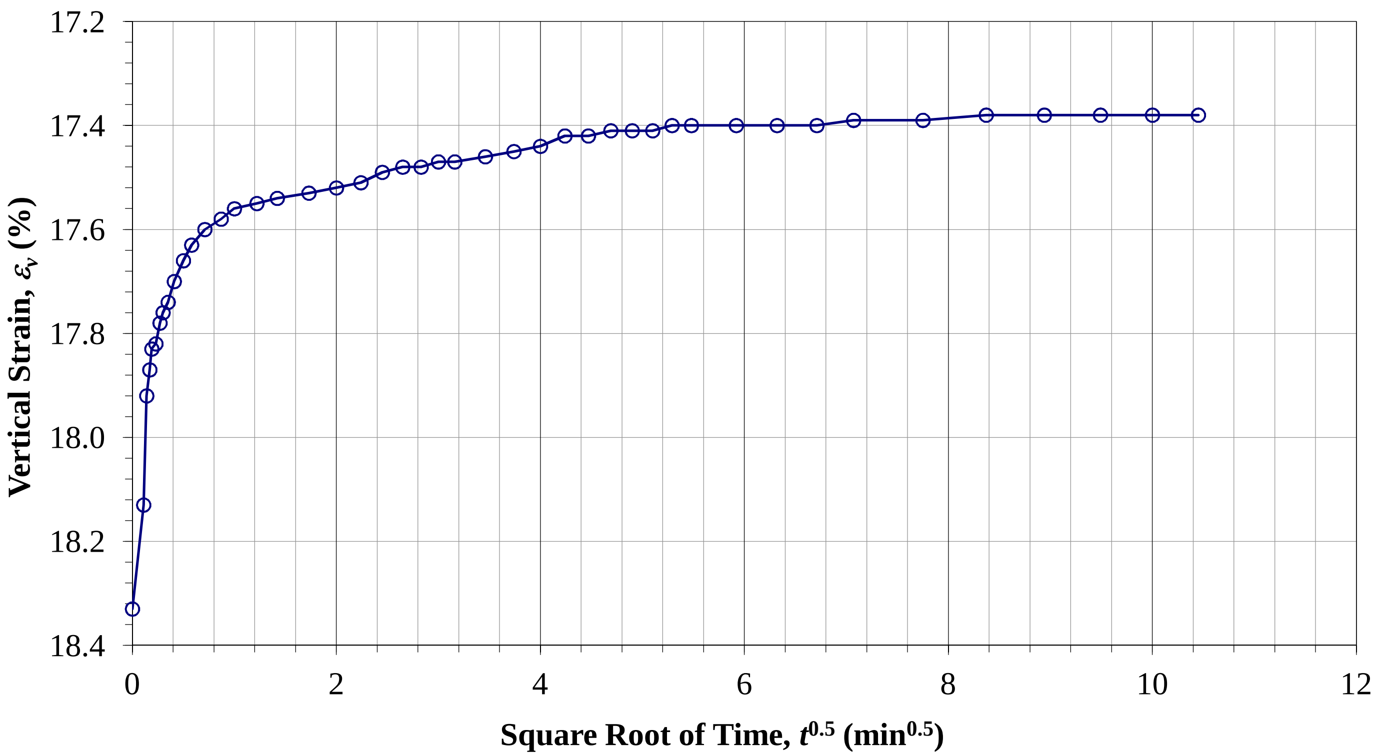
No: 00823-012 **Sample:**

Location: Logan, Utah **Depth:** 24.5'

Constant Load Step: 13 of 14

Stress: 1600 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

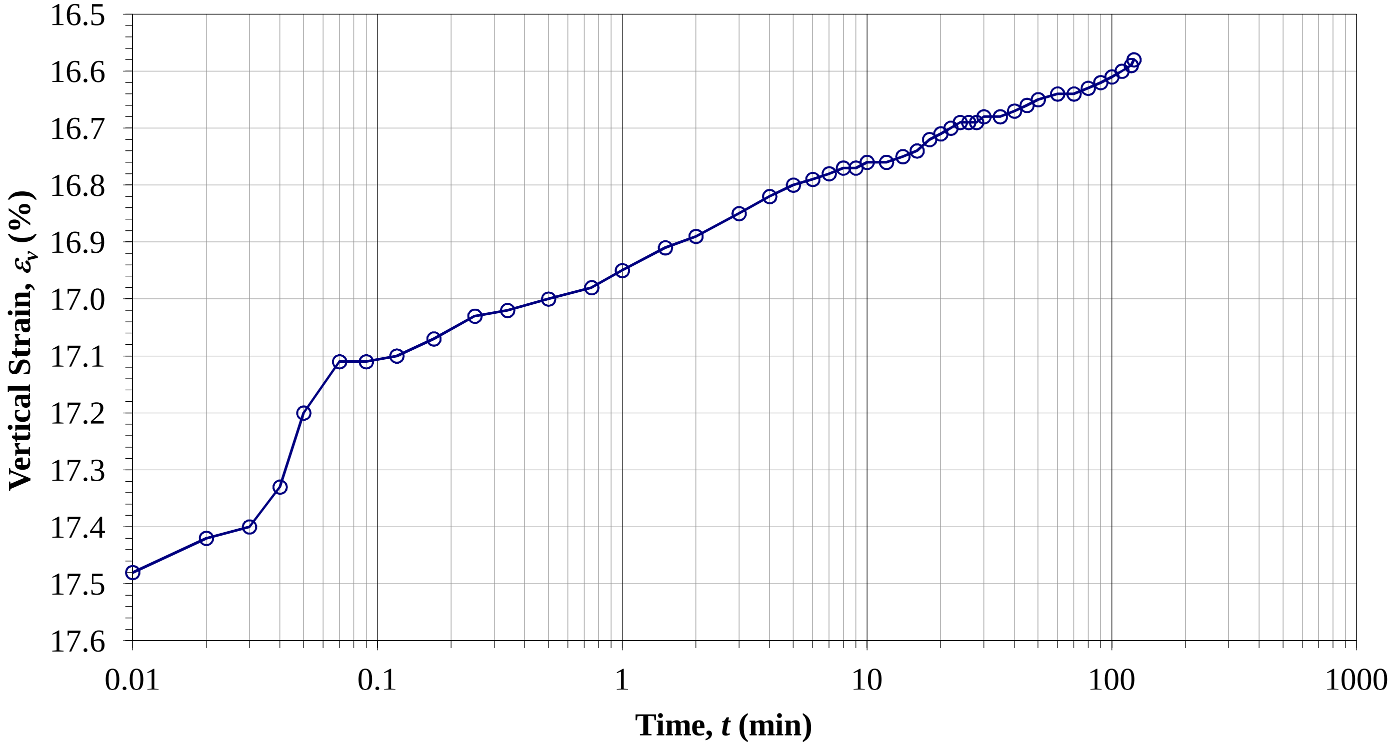
Project: **Logan WWTP** **Boring No.:** **B-05**

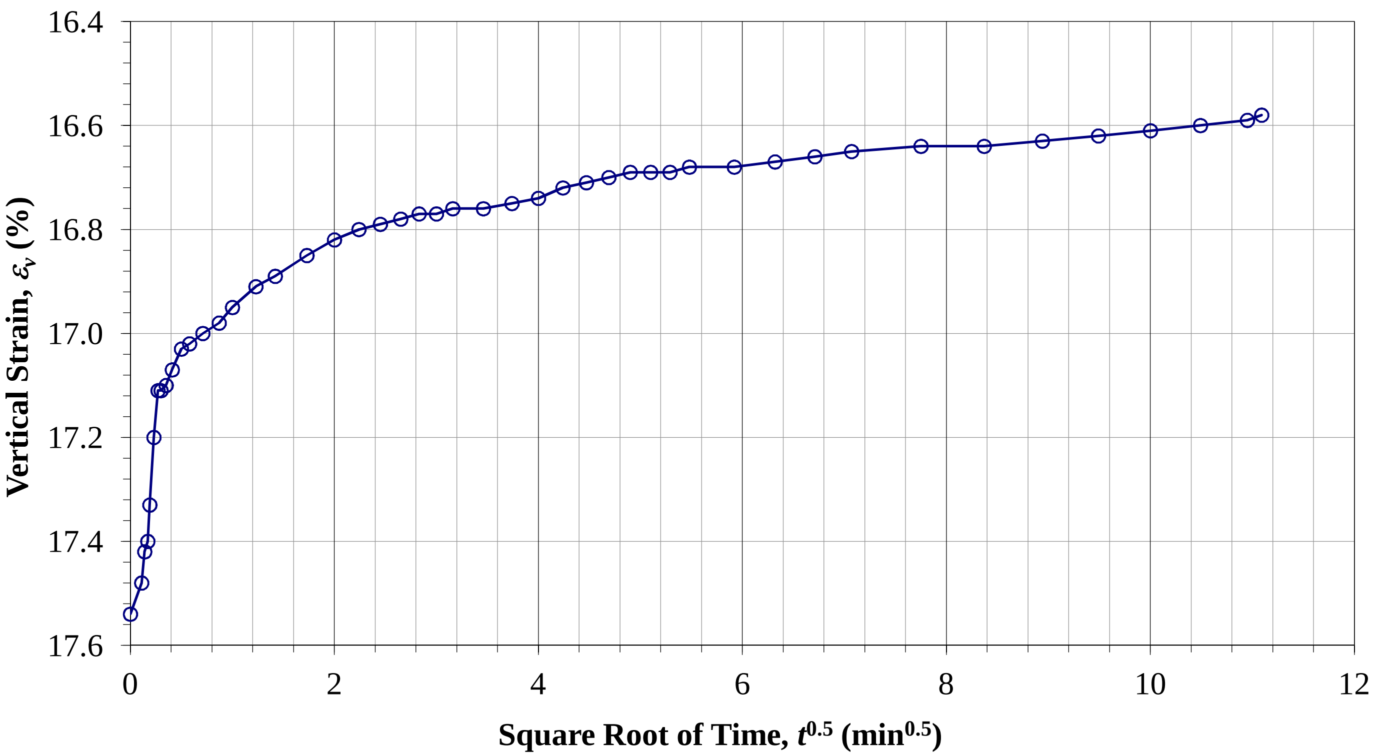
No: **00823-012** **Sample:**

Location: Logan, Utah **Depth:** **24.5'**

Constant Load Step: 14 of 14

Stress: 400 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/19/2013
By: MP

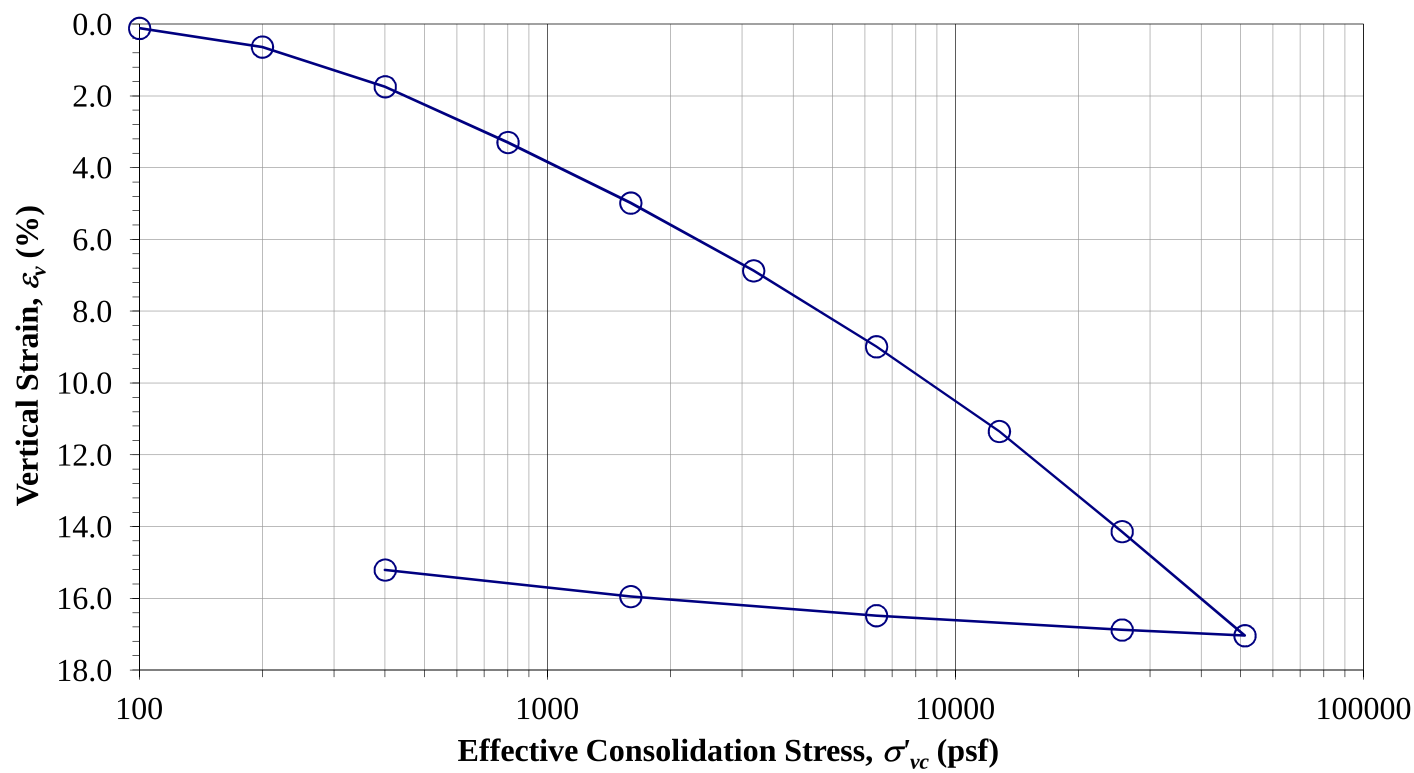
Boring No.: B-05
Sample:
Depth: 59.5'
Sample Description: Grey silt
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Test method:	B	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.8479
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	187.23	176.56
Wt. rings/tare (g)	46.04	46.04
Total unit wt., γ (pcf)	117.3	127.9
Wet soil + tare (g)	404.26	
Dry soil + tare (g)	335.60	
Tare (g)	123.75	
Water content, ω (%)	32.4	22.4
Dry unit wt., γ_d (pcf)	88.6	104.5
Saturation, S	0.98	1.00

*Note: C_v, C_c, C_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0000	0.00	1.0000	0.8811
100	0.0012	0.12	0.9988	0.8789
200	0.0064	0.64	0.9936	0.8691
400	0.0174	1.74	0.9826	0.8483
800	0.0330	3.30	0.9670	0.8191
1600	0.0499	4.99	0.9502	0.7873
3200	0.0687	6.87	0.9313	0.7518
6400	0.0899	8.99	0.9101	0.7120
12800	0.1135	11.35	0.8865	0.6676
25600	0.1414	14.14	0.8586	0.6151
51200	0.1704	17.04	0.8296	0.5606
25600	0.1688	16.88	0.8312	0.5636
6400	0.1648	16.48	0.8352	0.5711
1600	0.1595	15.95	0.8405	0.5811
400	0.1521	15.21	0.8479	0.5950



Entered: ________
Reviewed: ________

Z:\PROJECTS\00823_Carollo\012_Logan_WWTP\[CONSOL_GC+TRv1_B-05_59.5.xls]CON

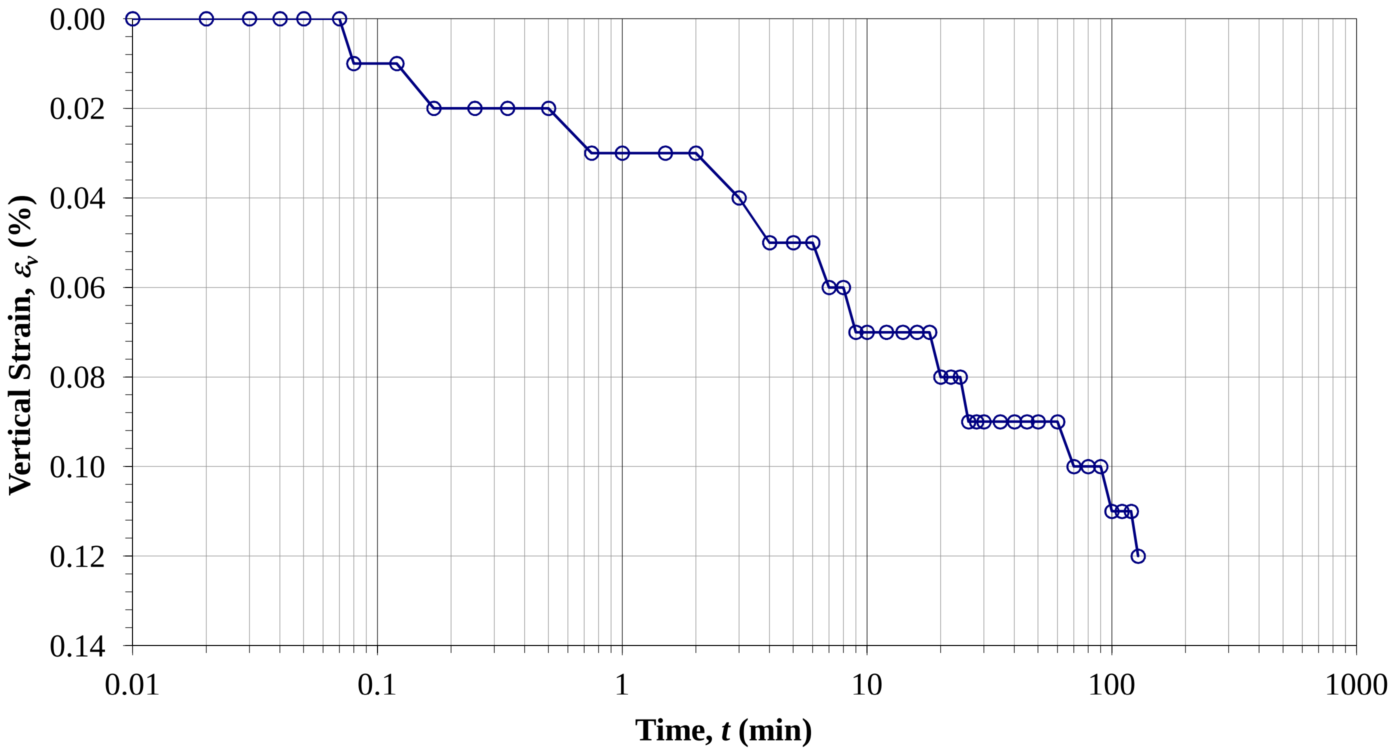
One-Dimensional Consolidation Properties of Soils

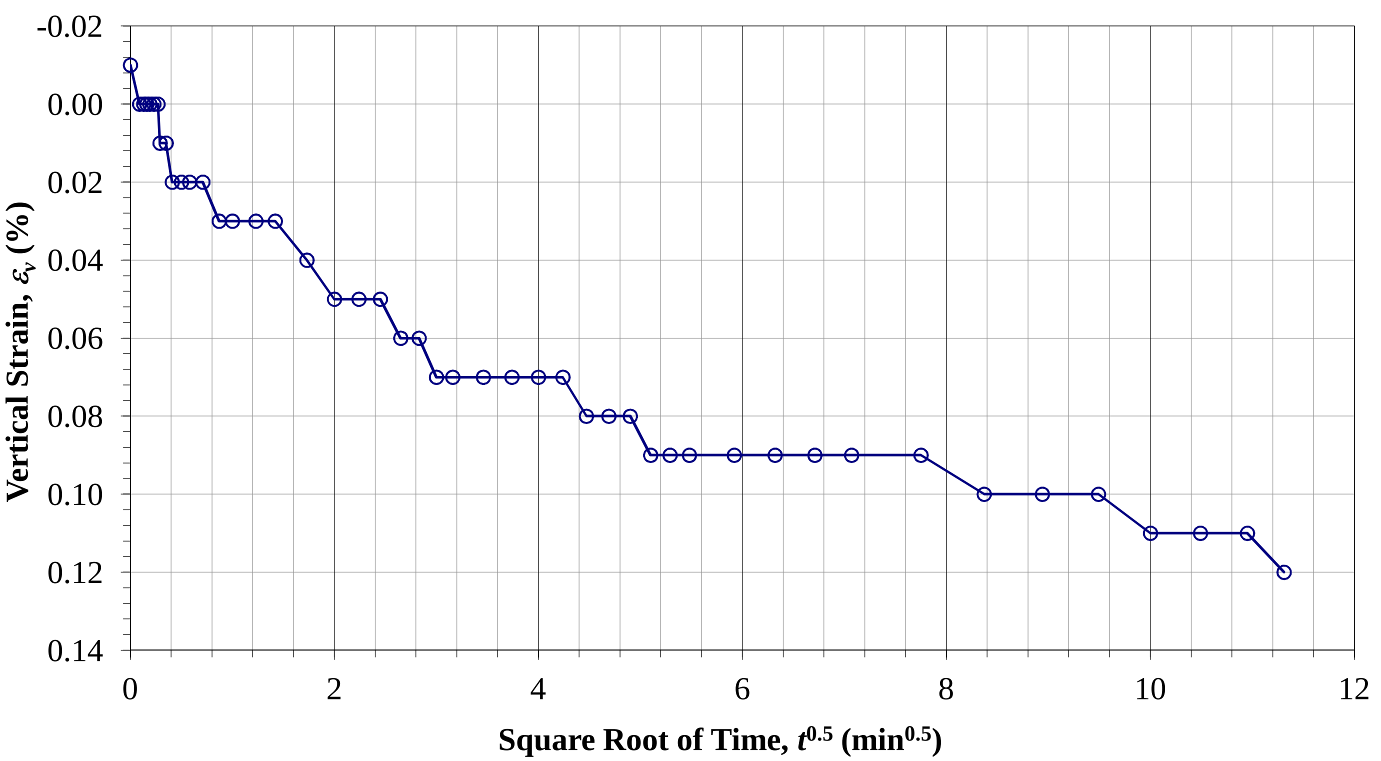
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 59.5'

Constant Load Step: 1 of 14
Stress: 100 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

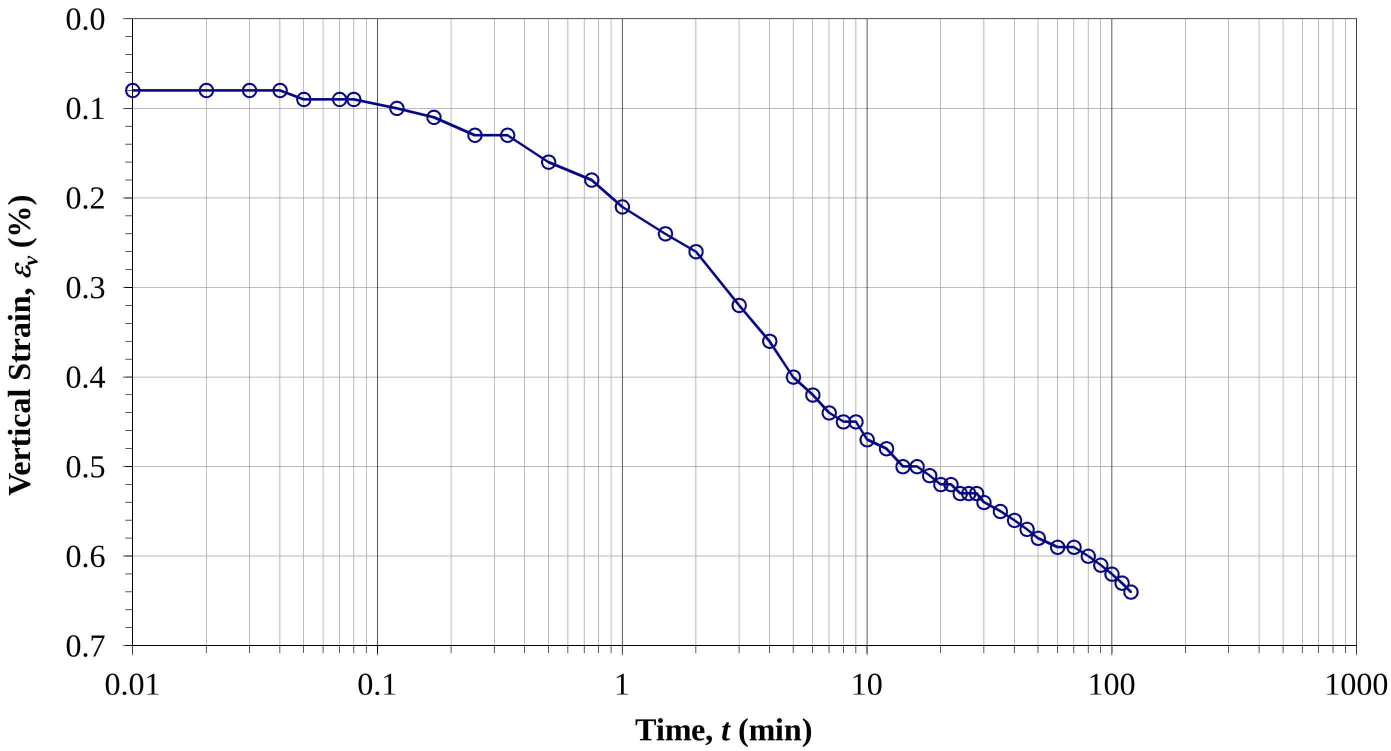
Project: **Logan WWTP** **Boring No.:** **B-05**

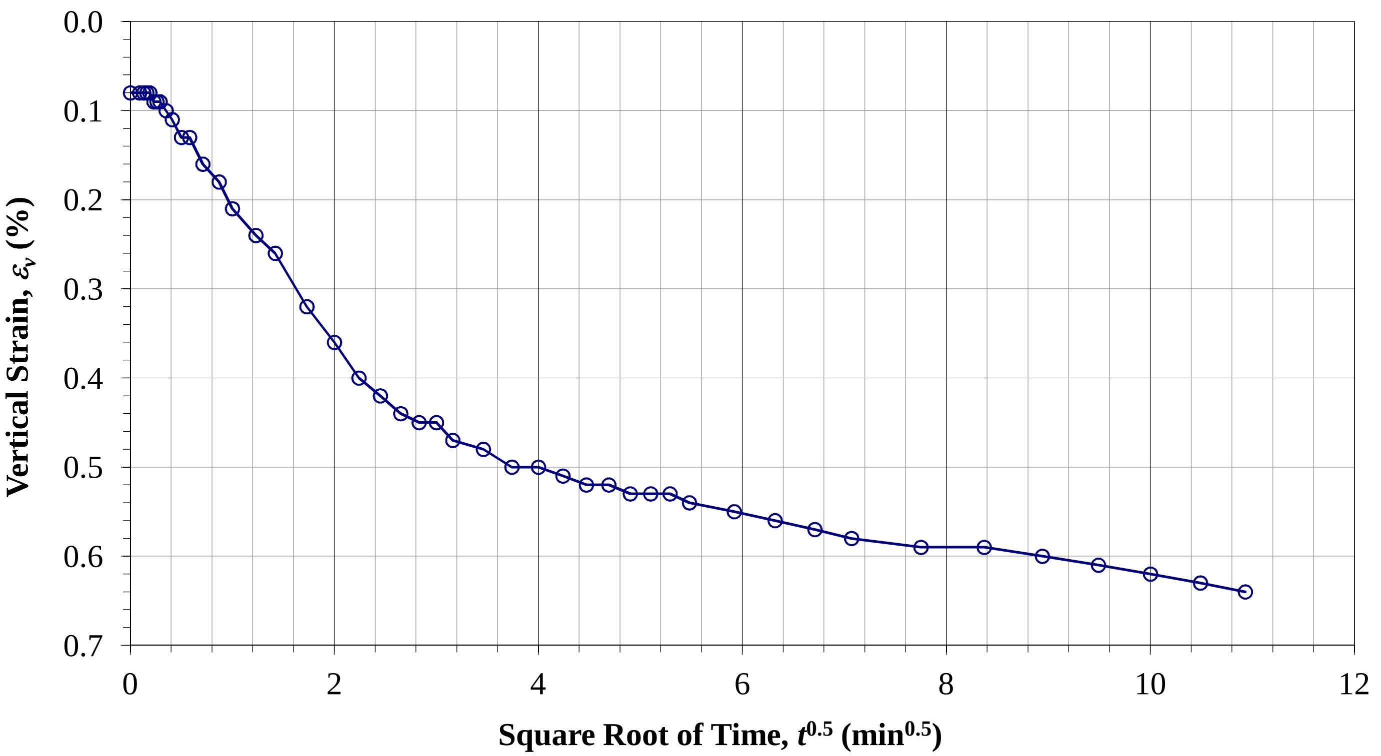
No: **00823-012** **Sample:**

Location: Logan, Utah **Depth:** **59.5'**

Constant Load Step: 2 of 14

Stress: 200 psf



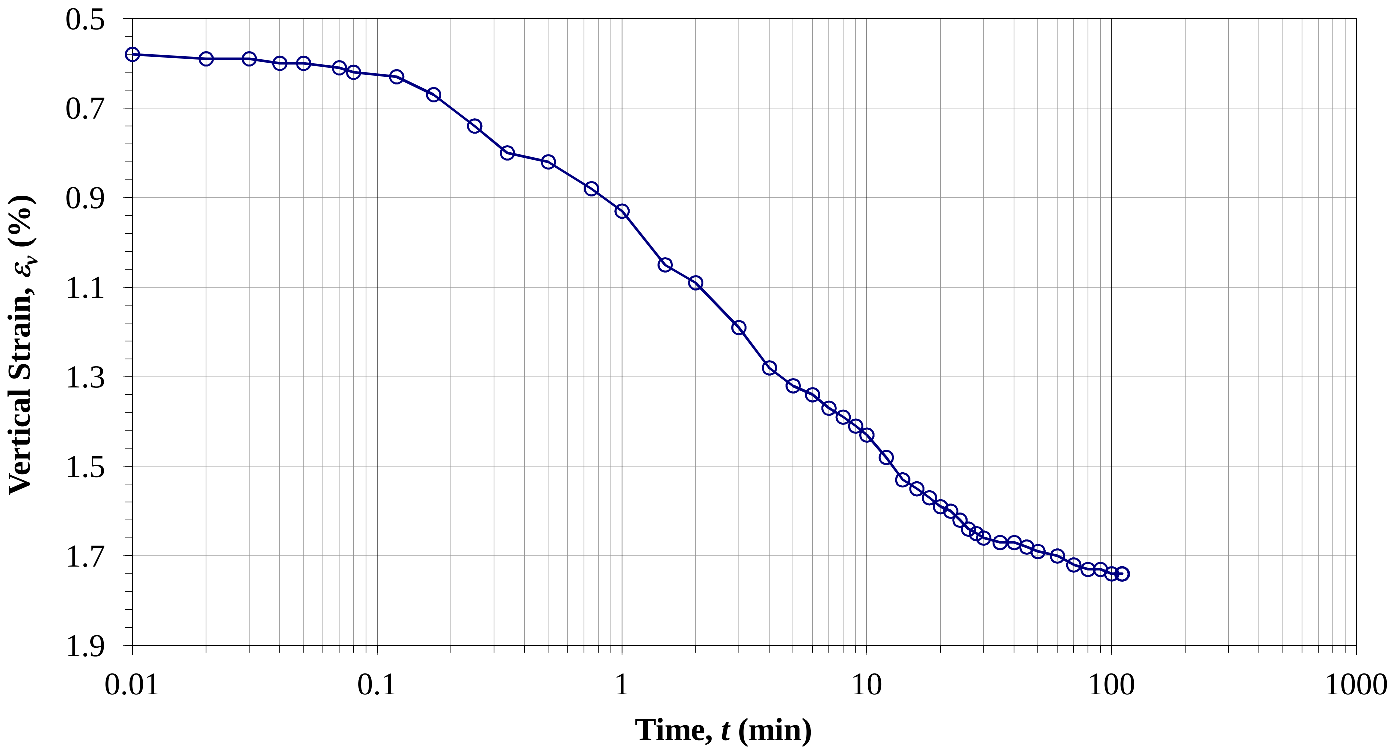


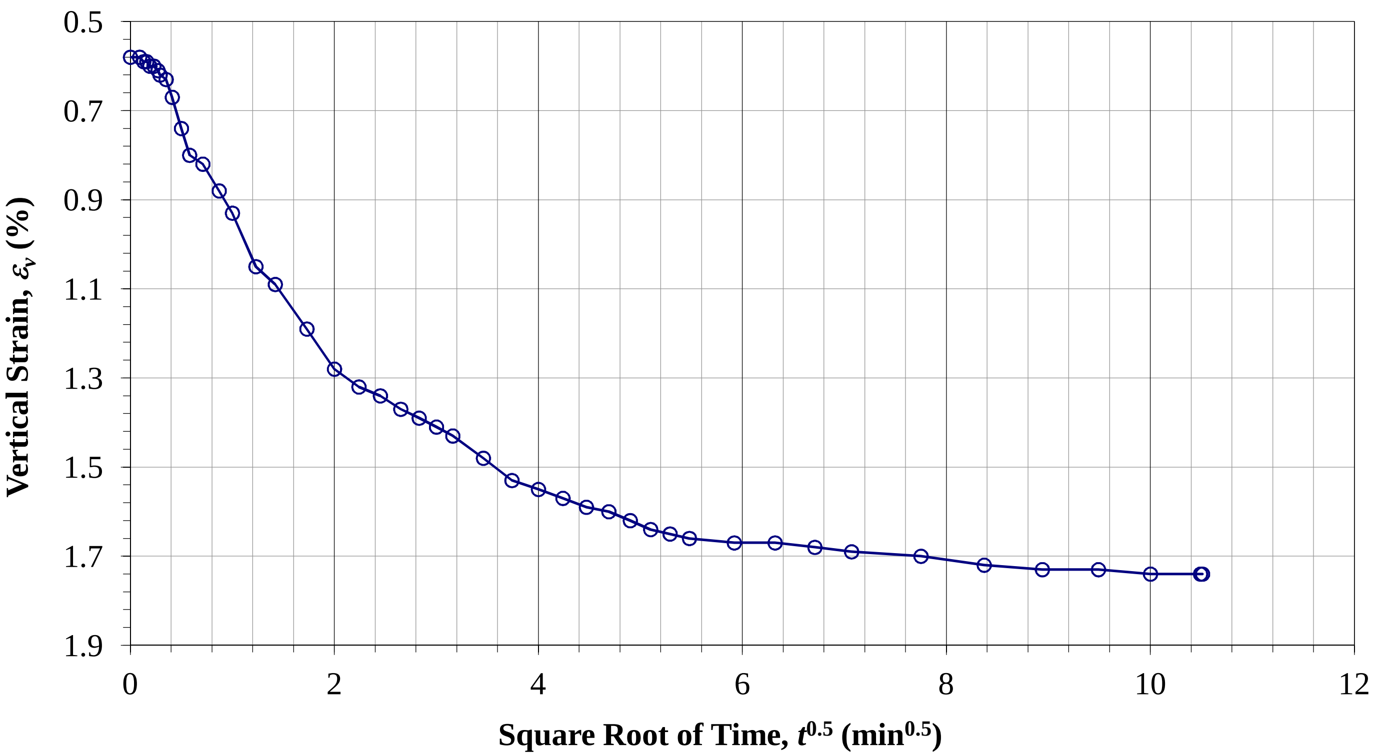
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 59.5'

Constant Load Step: 3 of 14
Stress: 400 psf





One-Dimensional Consolidation Properties of Soils

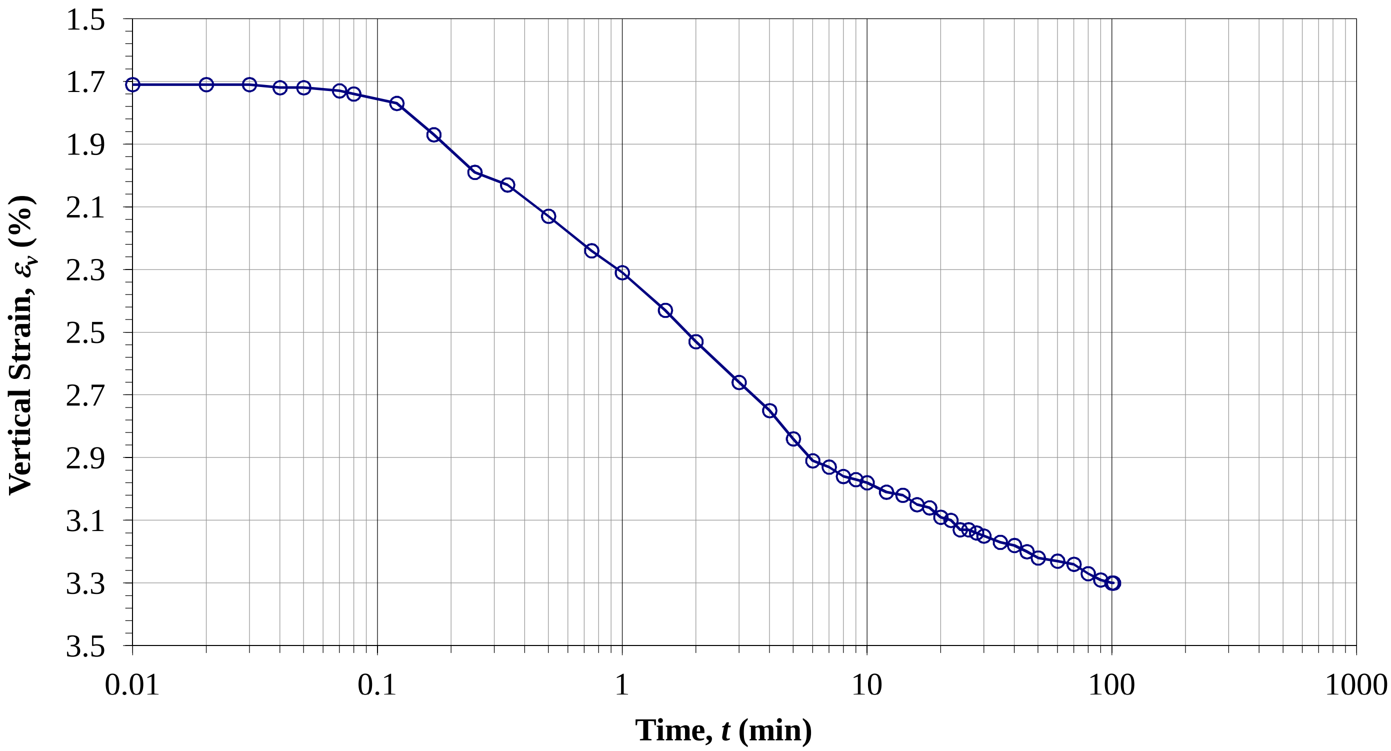
(ASTM D2435)

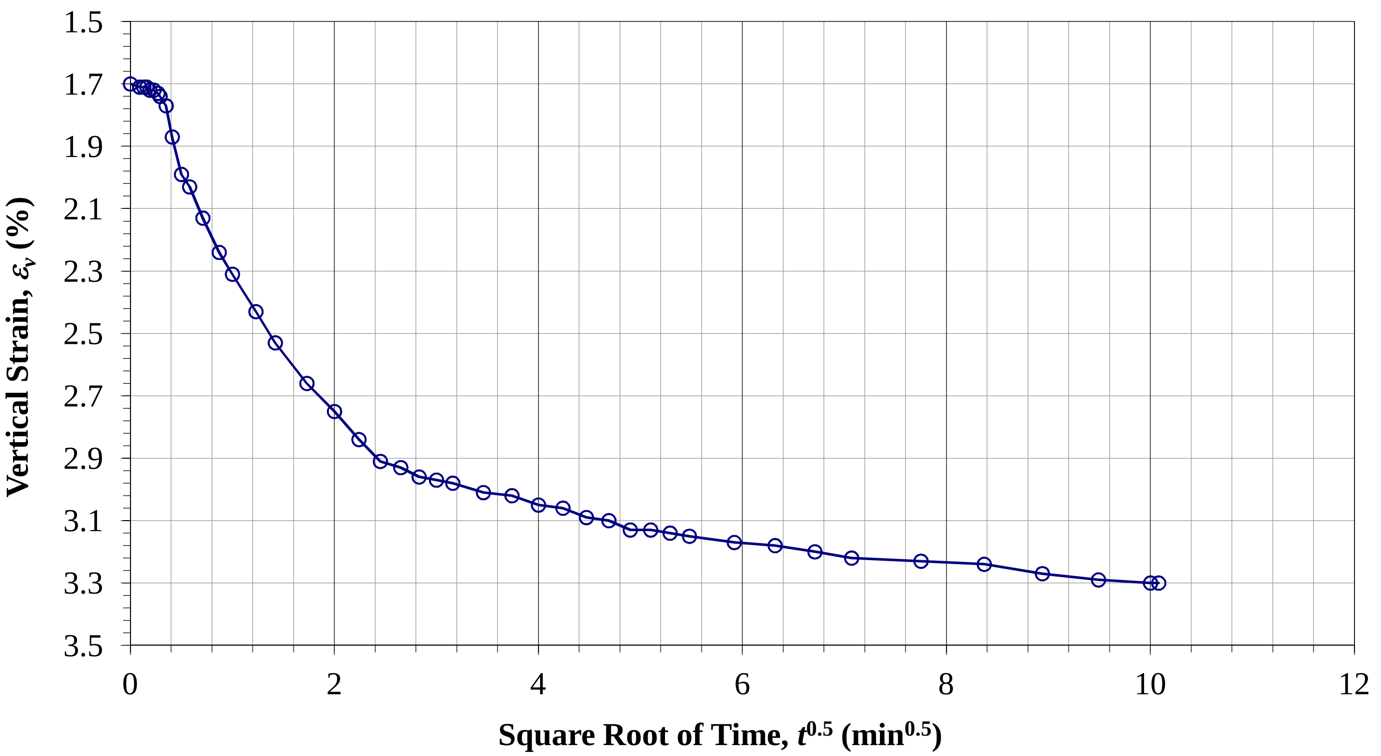
© IGES 2011, 2013

Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah

Boring No.: **B-05**
Sample:
Depth: **59.5'**

Constant Load Step: 4 of 14
Stress: 800 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

IGES

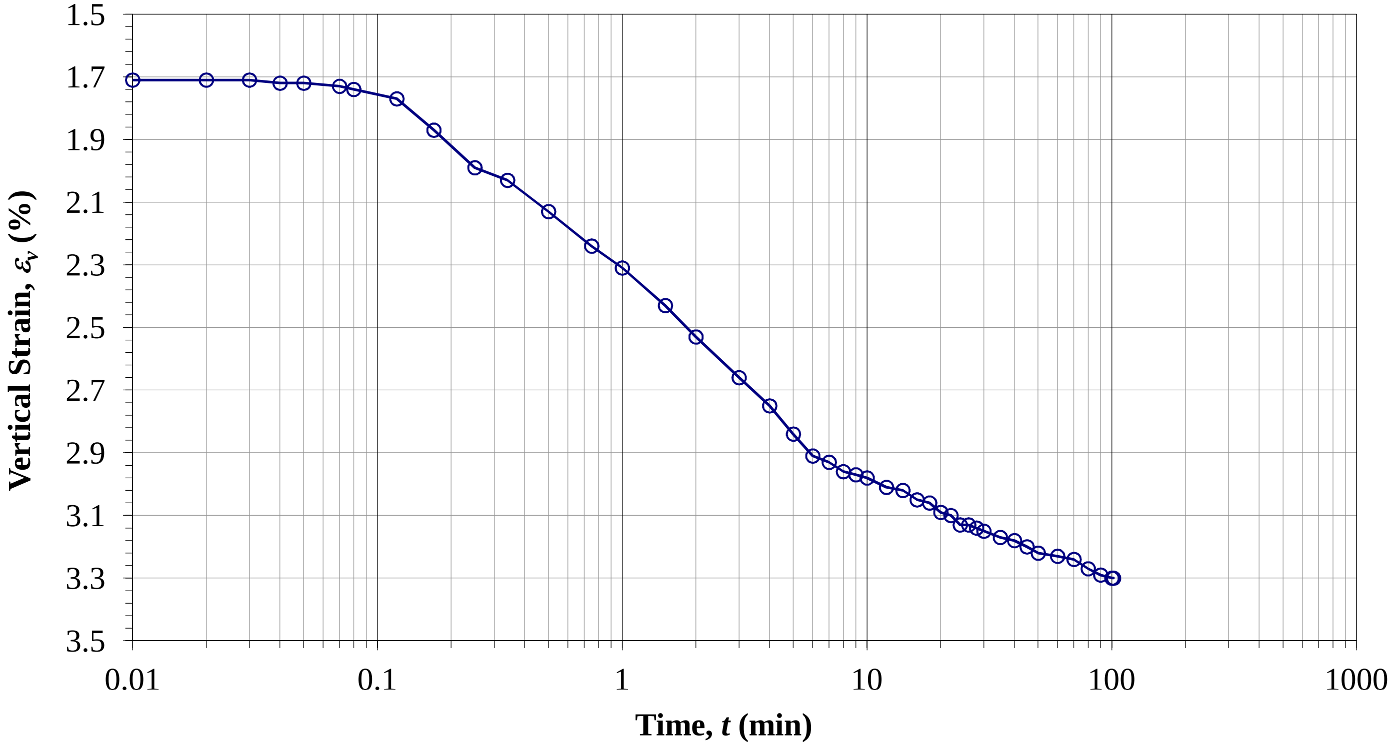
Project: **Logan WWTP** | **Boring No.:** **B-05**

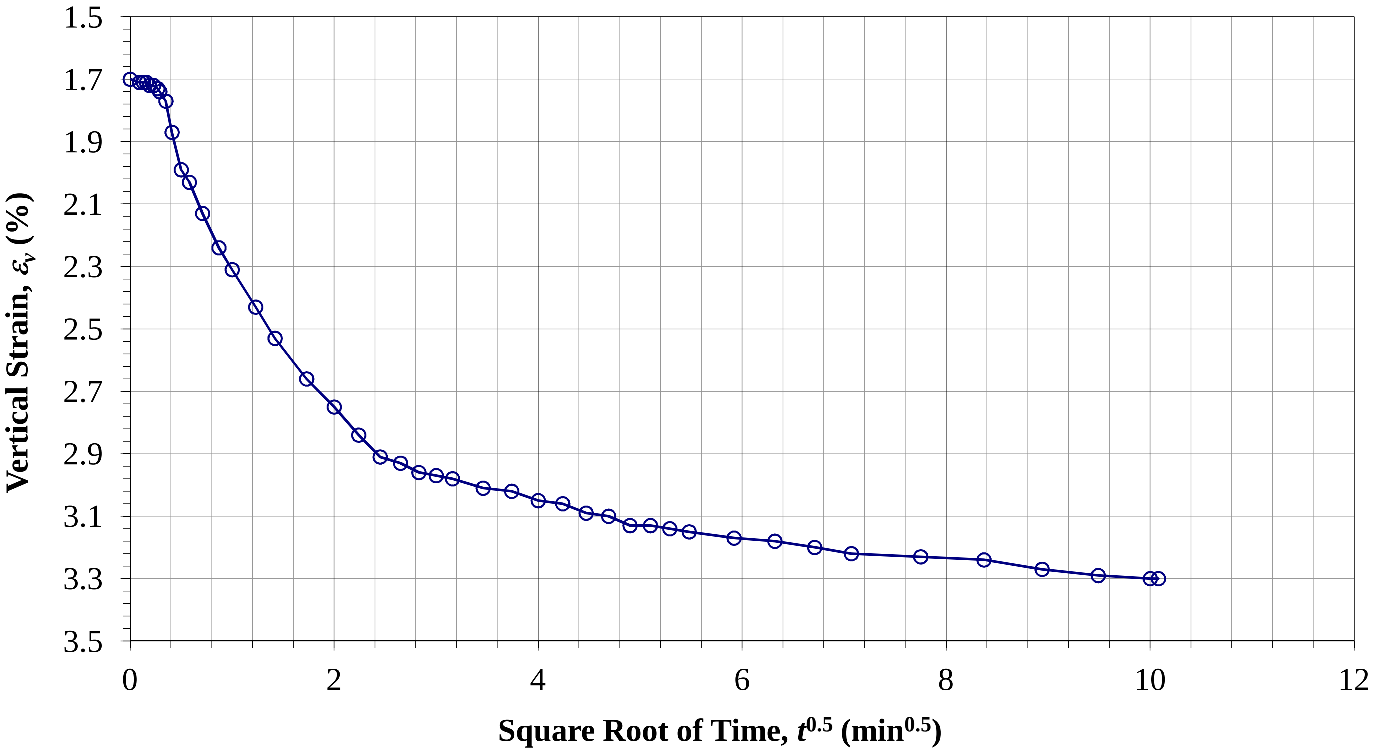
No: **00823-012** | **Sample:**

Location: Logan, Utah | **Depth:** **59.5'**

Constant Load Step: 5 of 14

Stress: 1600 psf





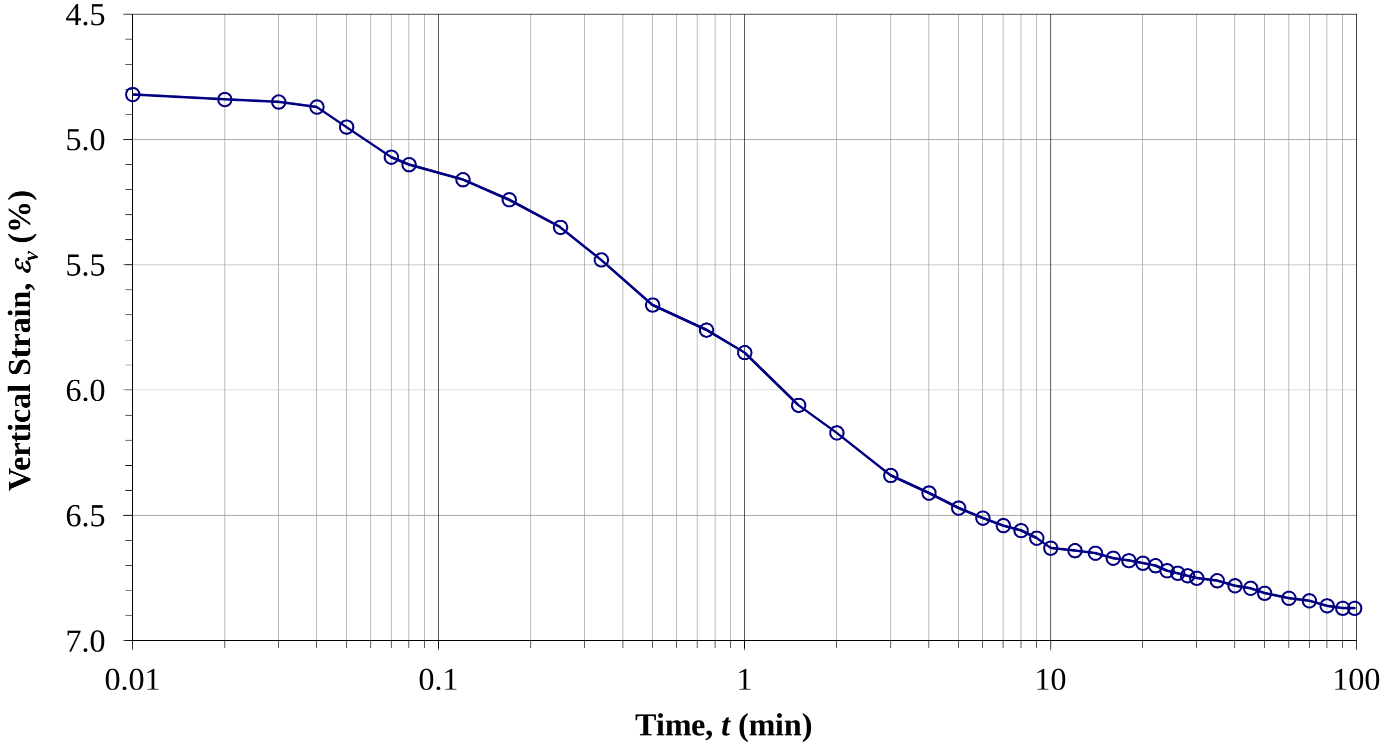
One-Dimensional Consolidation Properties of Soils

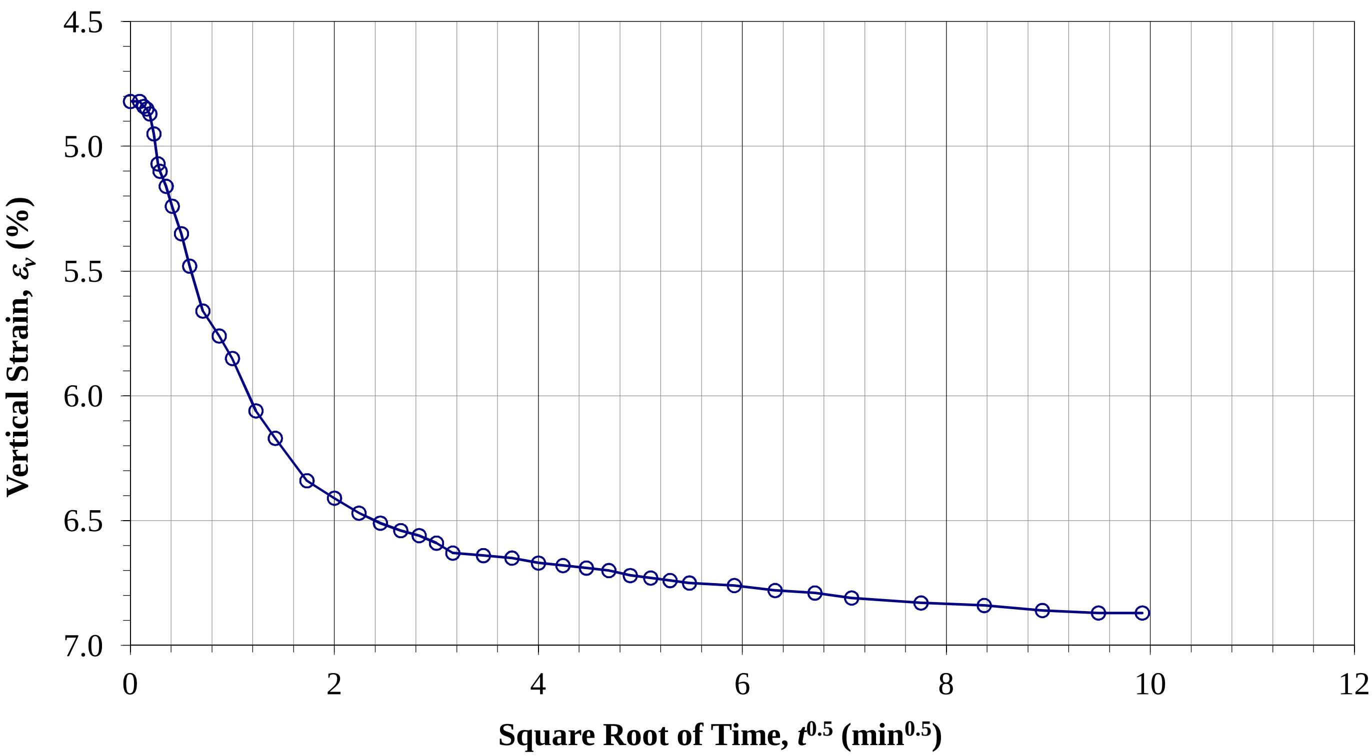
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 59.5'

Constant Load Step: 6 of 14
Stress: 3200 psf

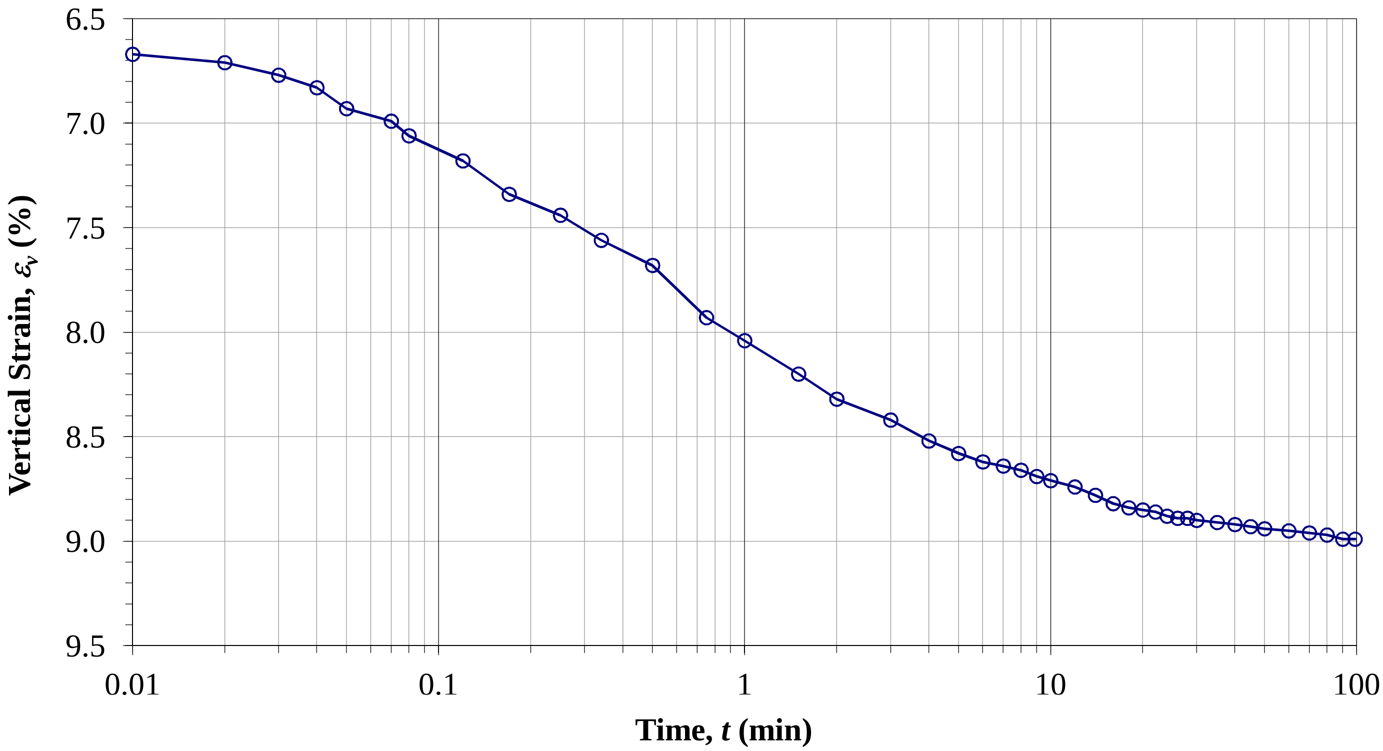


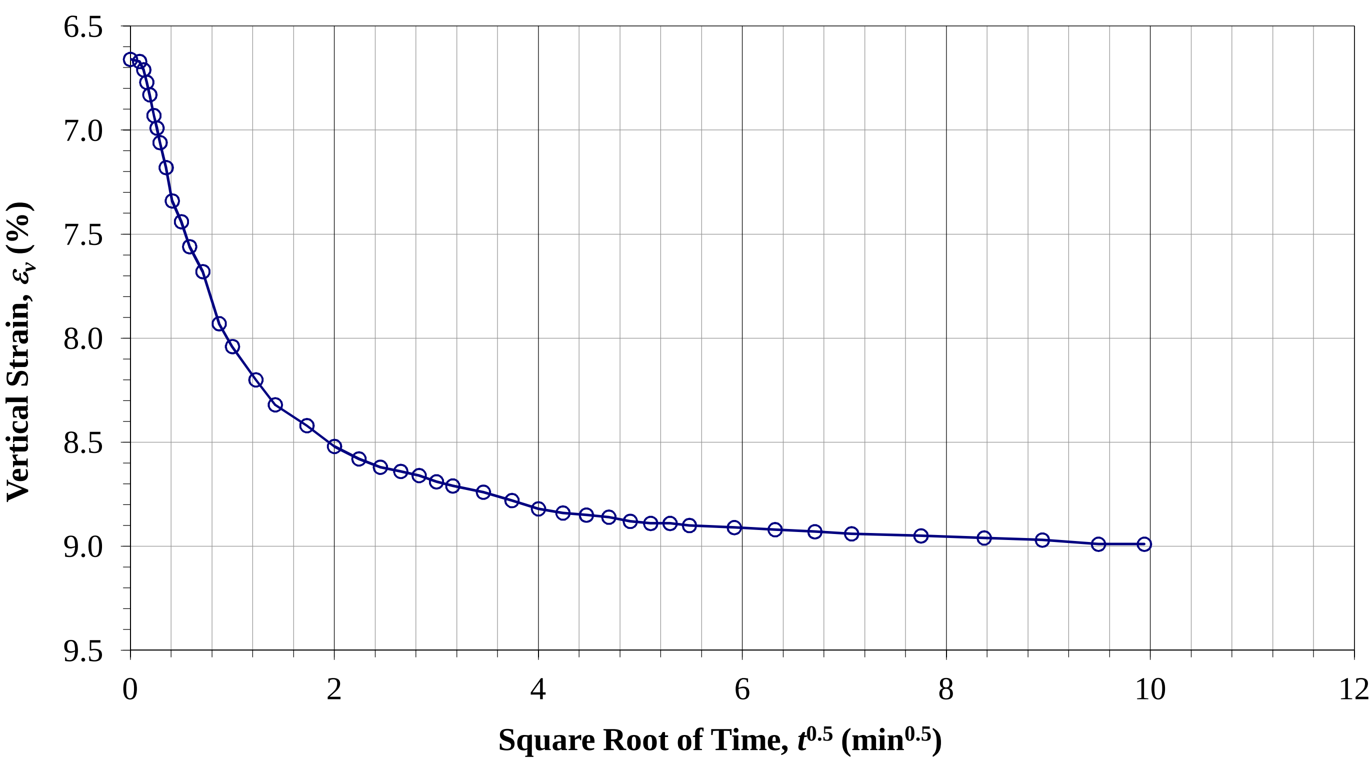


One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Boring No.: B-05
Sample:
Depth: 59.5'

Constant Load Step: 7 of 14
Stress: 6400 psf





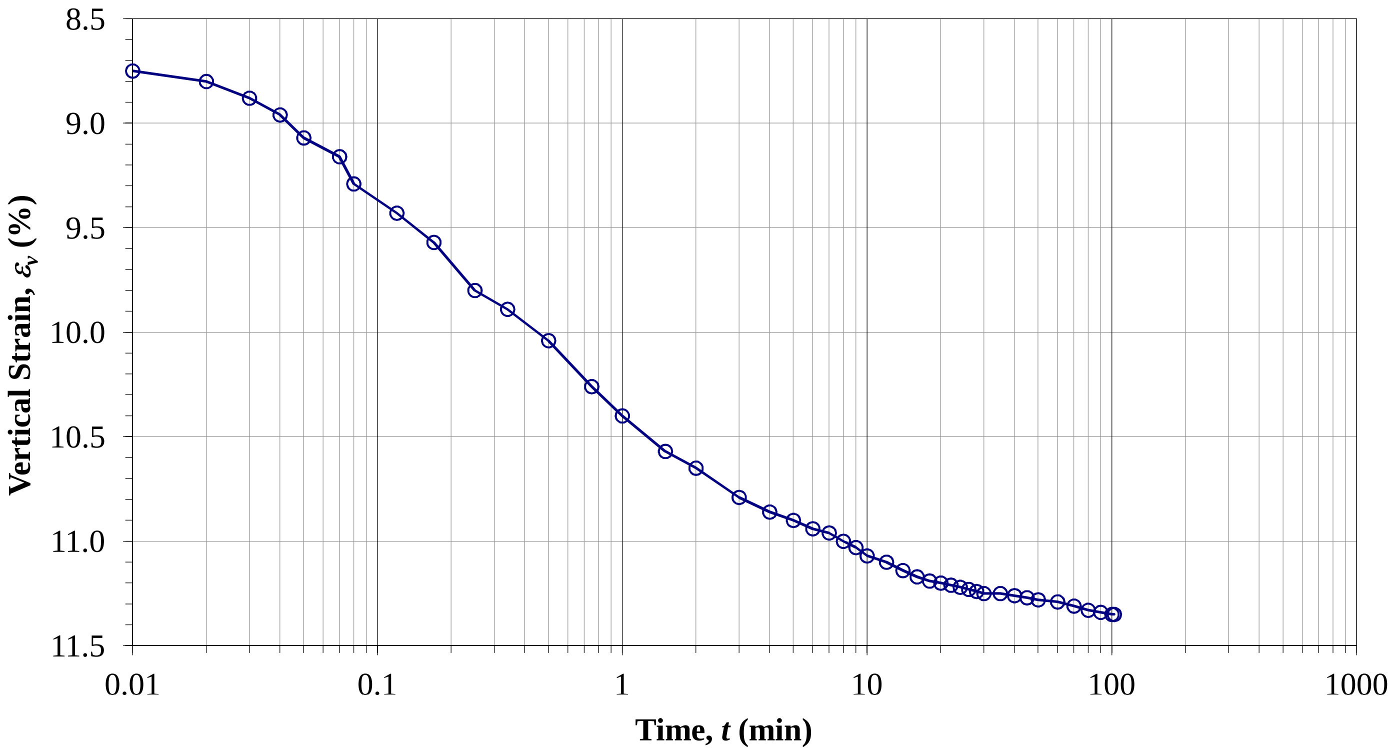
One-Dimensional Consolidation Properties of Soils

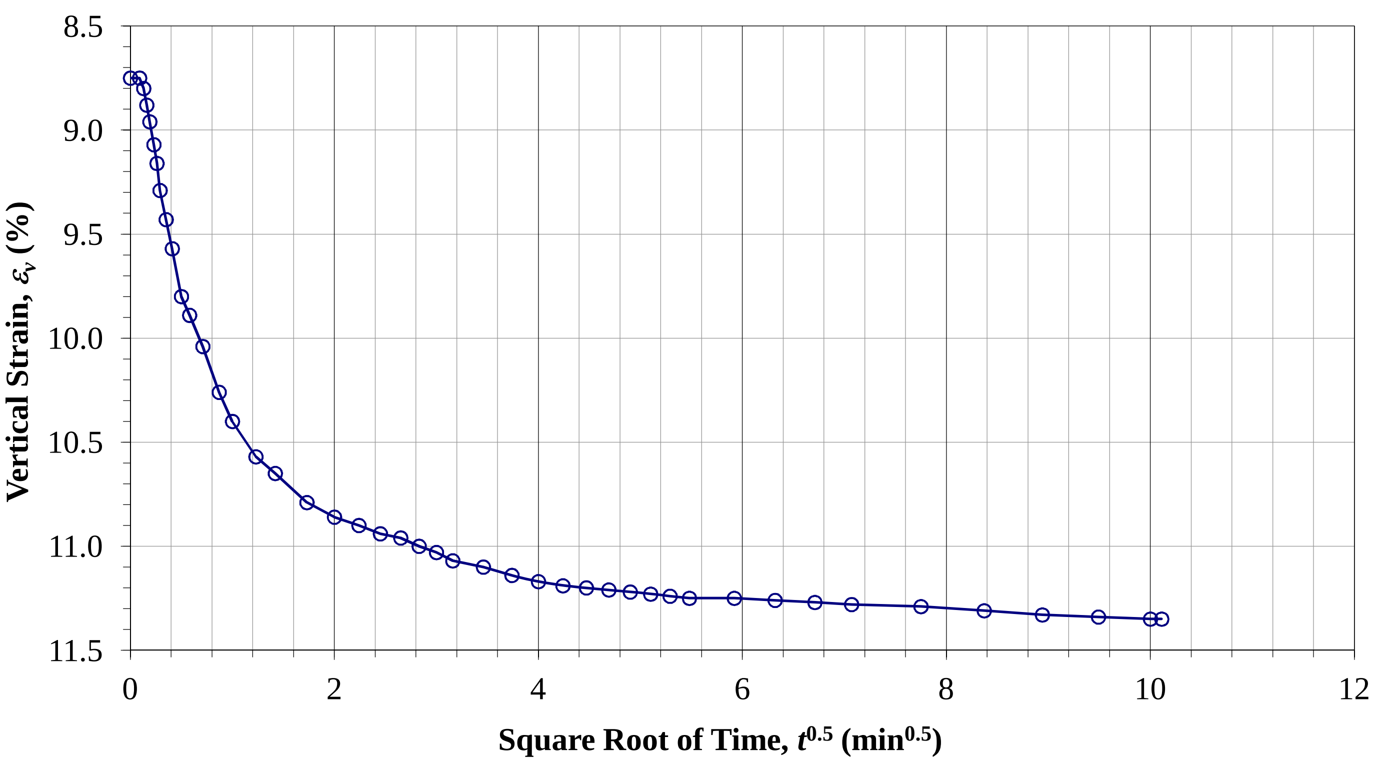
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 59.5'

Constant Load Step: 8 of 14
Stress: 12800 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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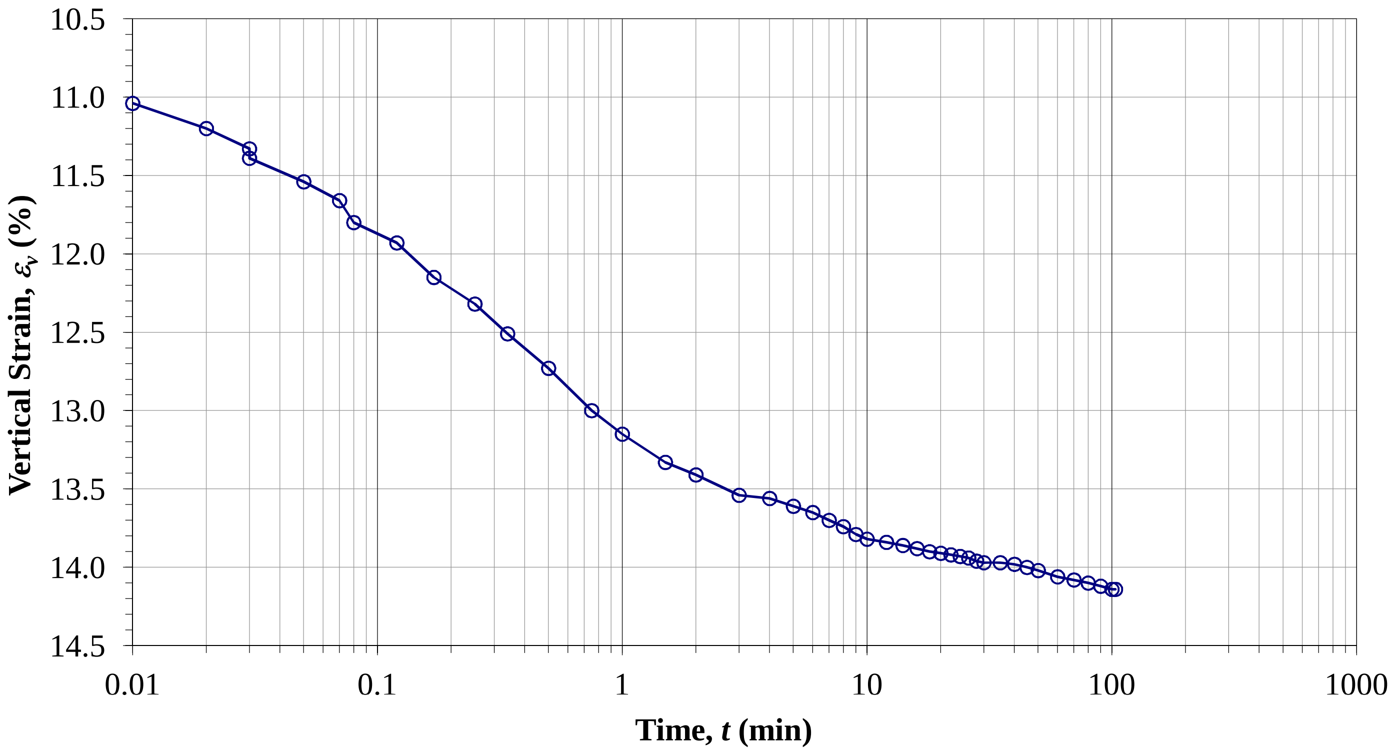
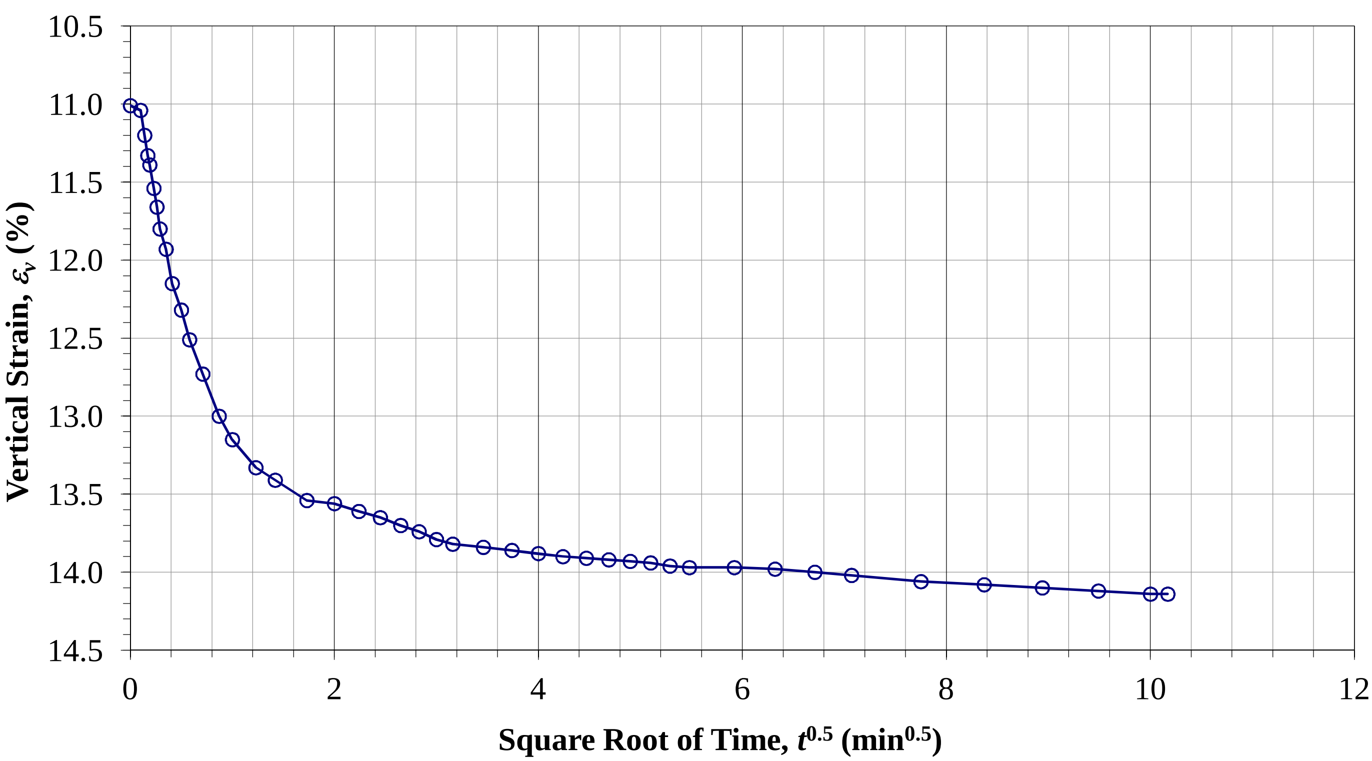
Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah

Boring No.: **B-05**
Sample:
Depth: **59.5'**

Constant Load Step: 9 of 14
Stress: 25600 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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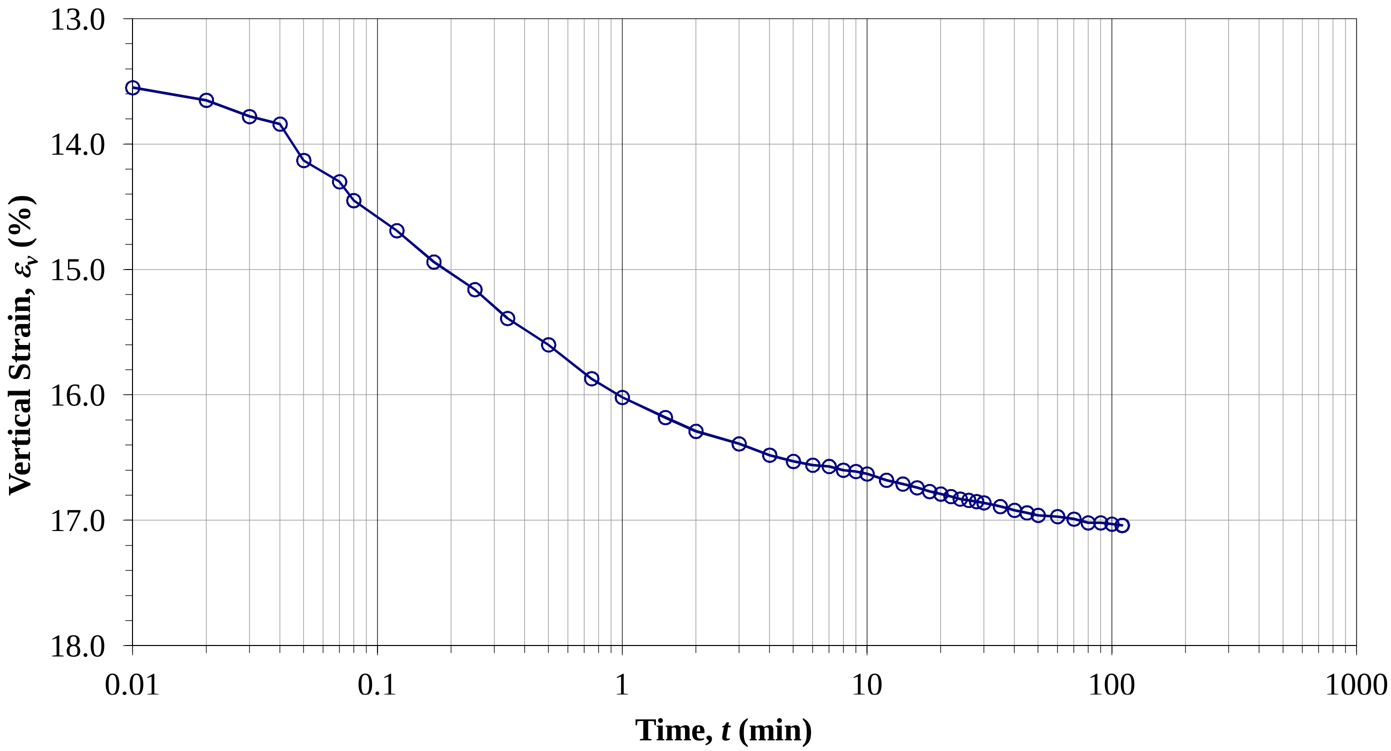
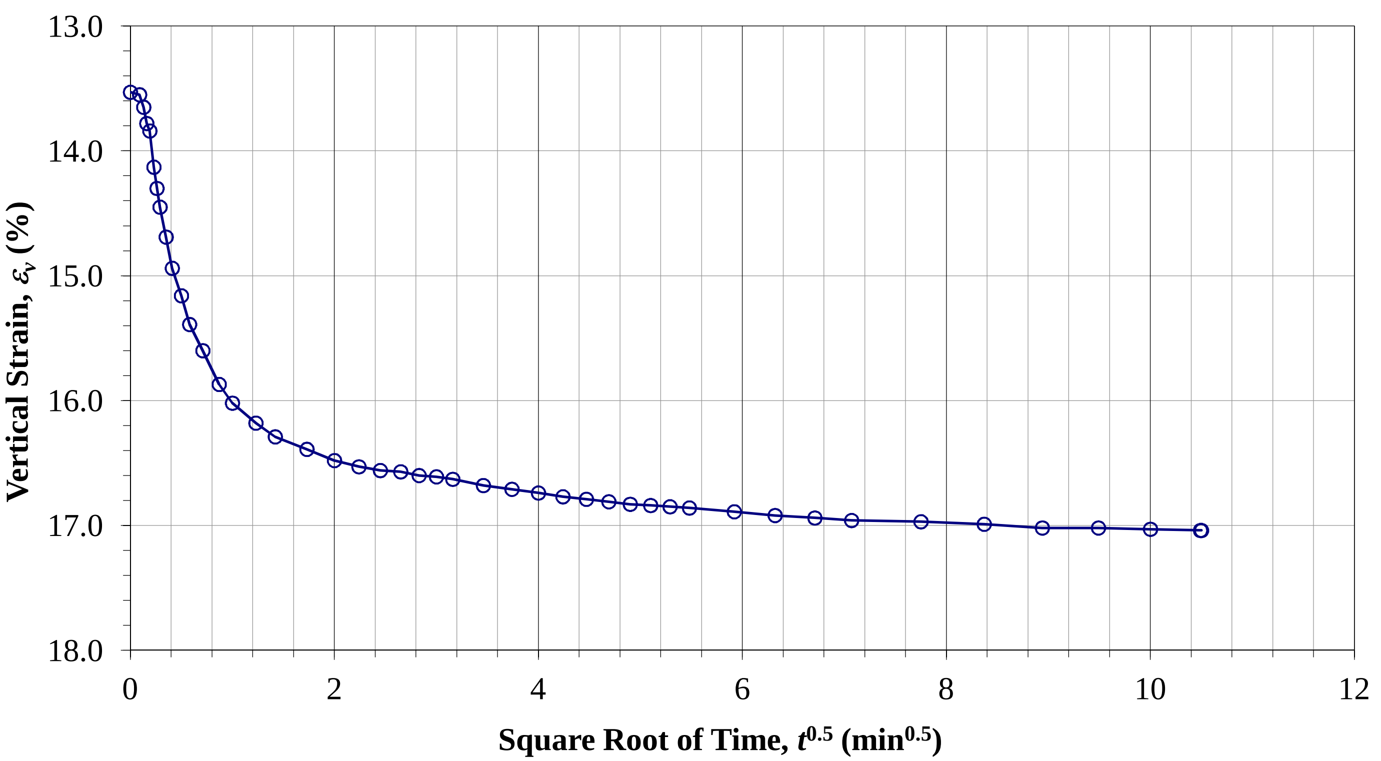
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 59.5'

Constant Load Step: 10 of 14
Stress: 51200 psf





One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

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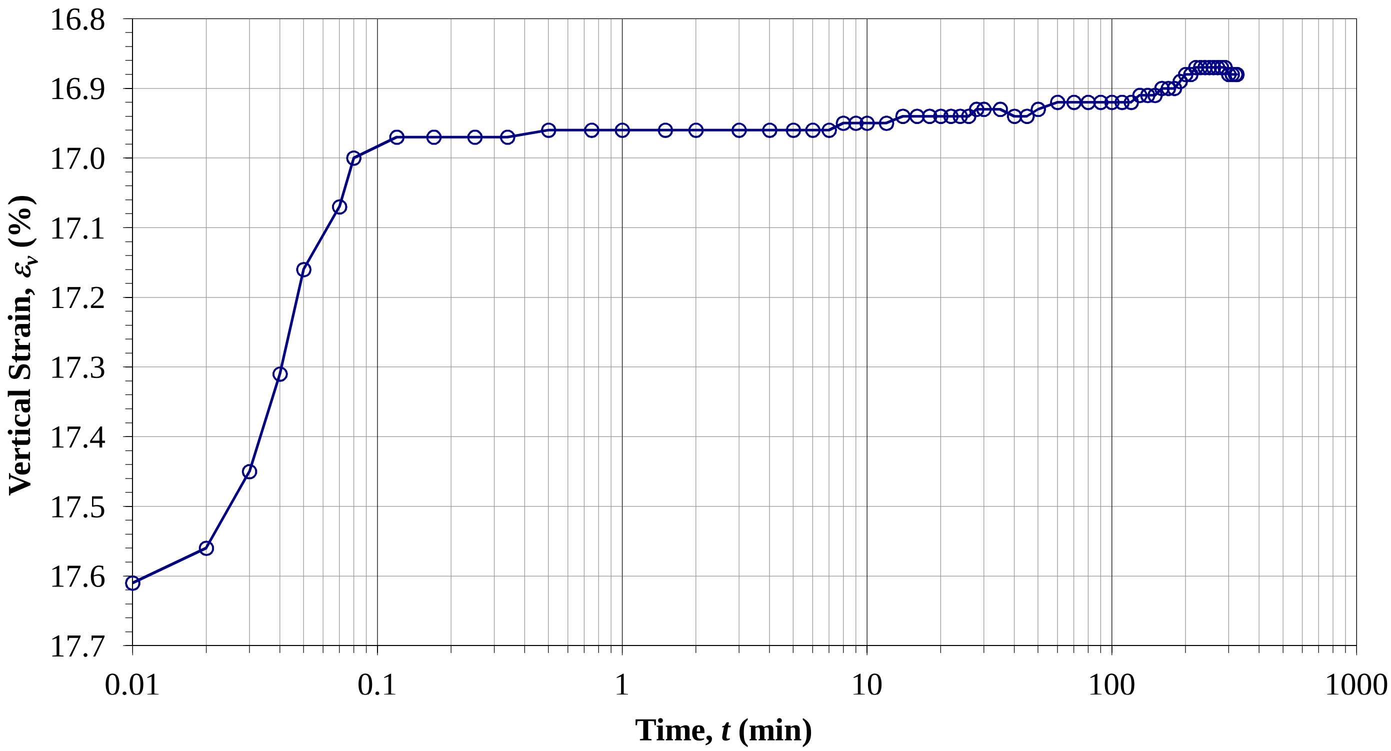
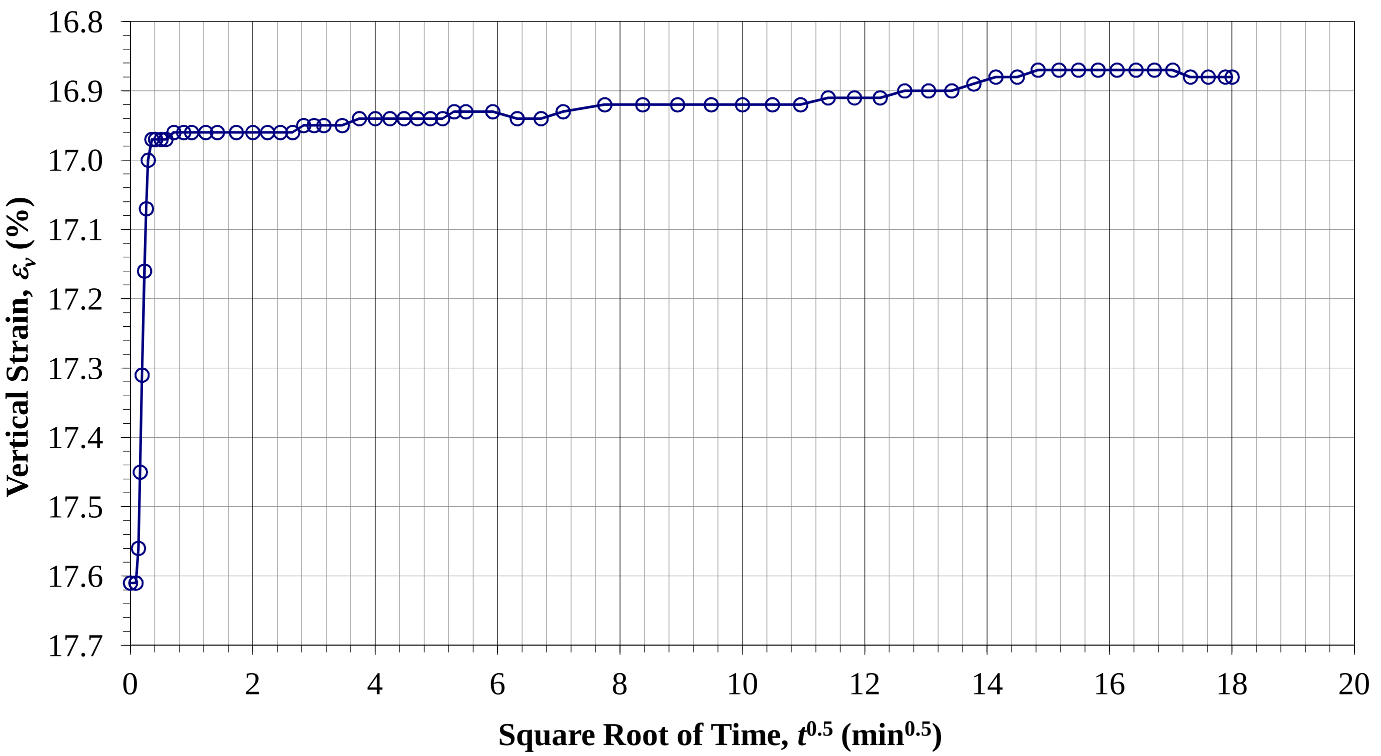
Project: **Logan WWTP** **Boring No.:** **B-05**
No: **00823-012** **Sample:**
Location: Logan, Utah **Depth:** **59.5'**

Constant Load Step: 11 of 14
Stress: 25600 psf



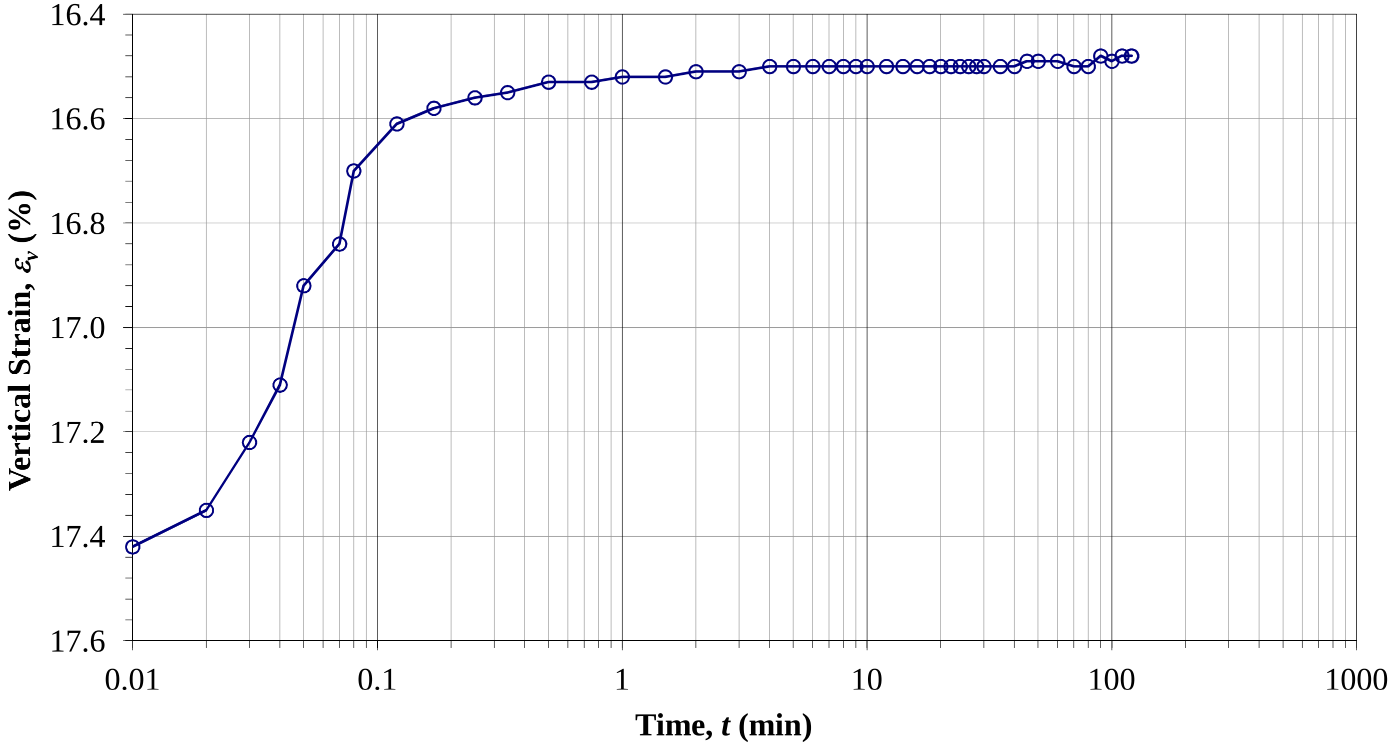


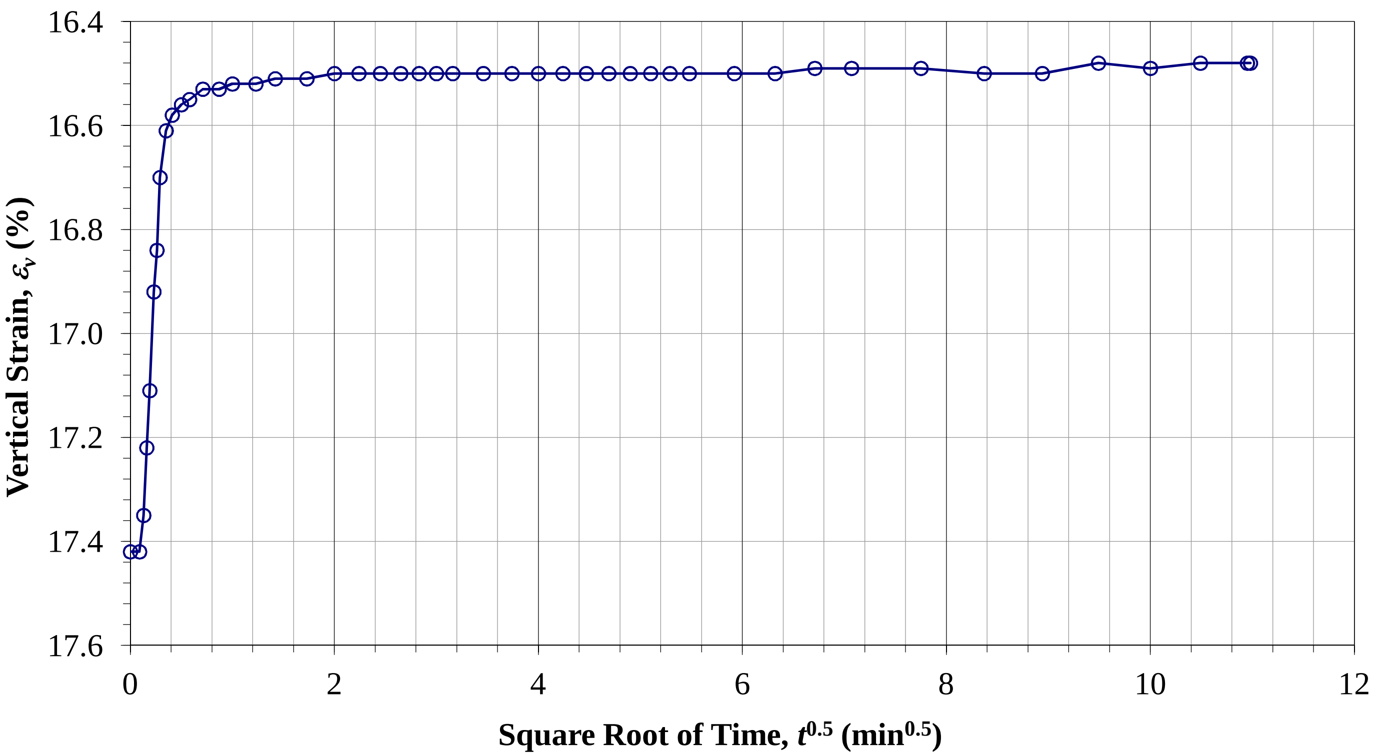
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 59.5'

Constant Load Step: 12 of 14
Stress: 6400 psf





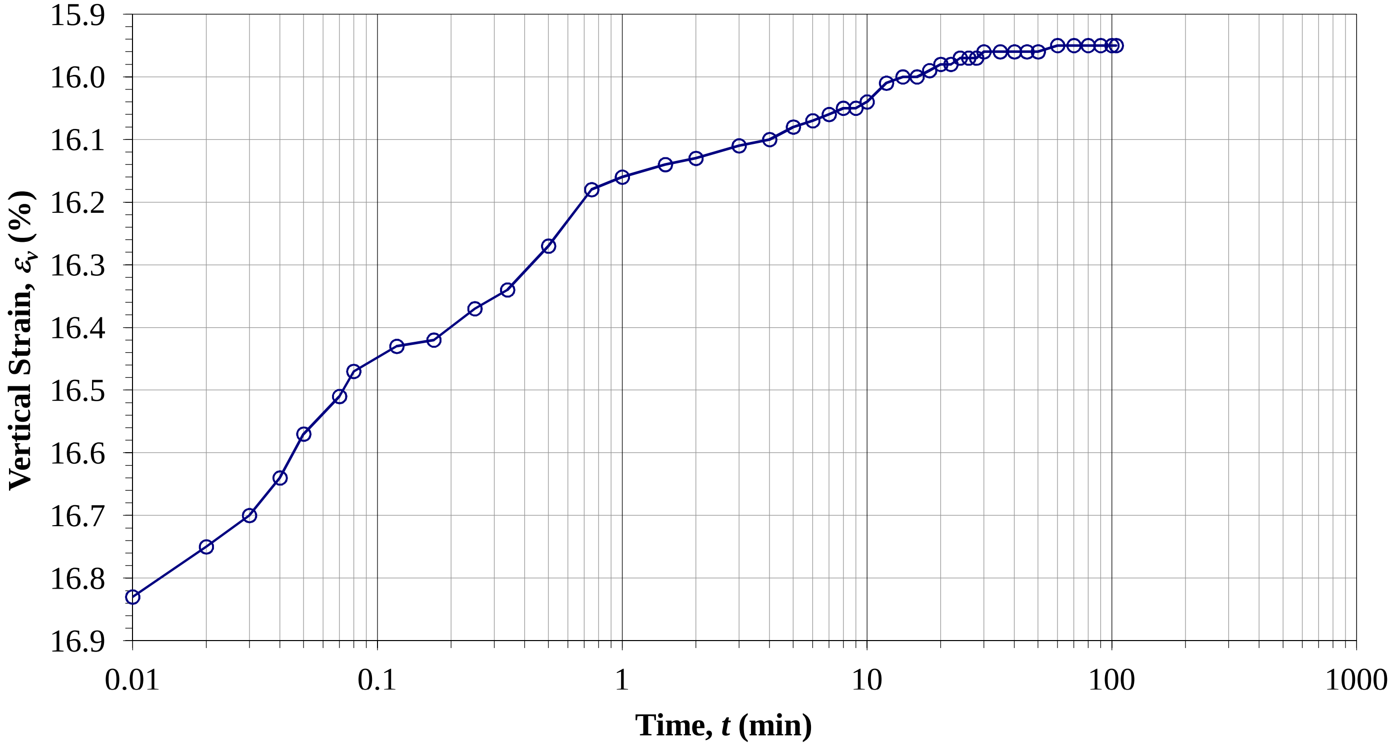
One-Dimensional Consolidation Properties of Soils

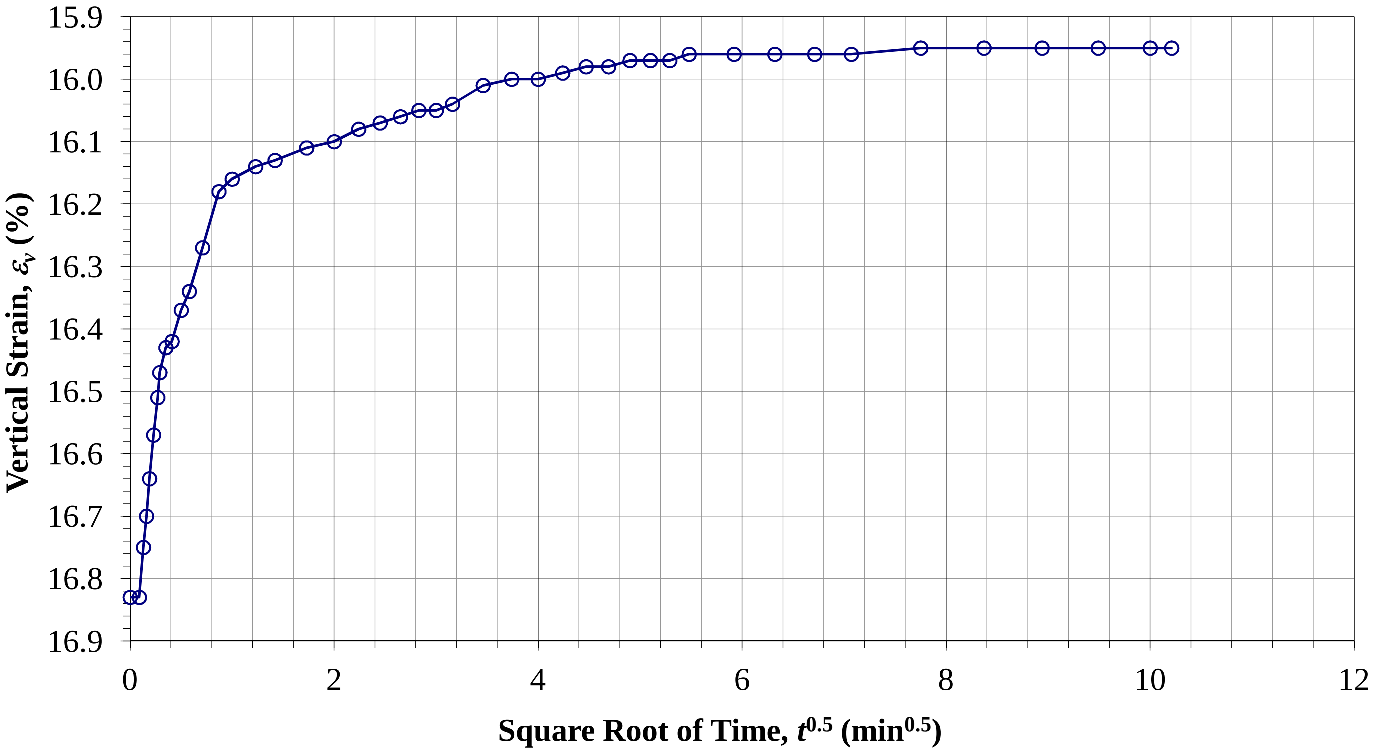
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 59.5'

Constant Load Step: 13 of 14
Stress: 1600 psf





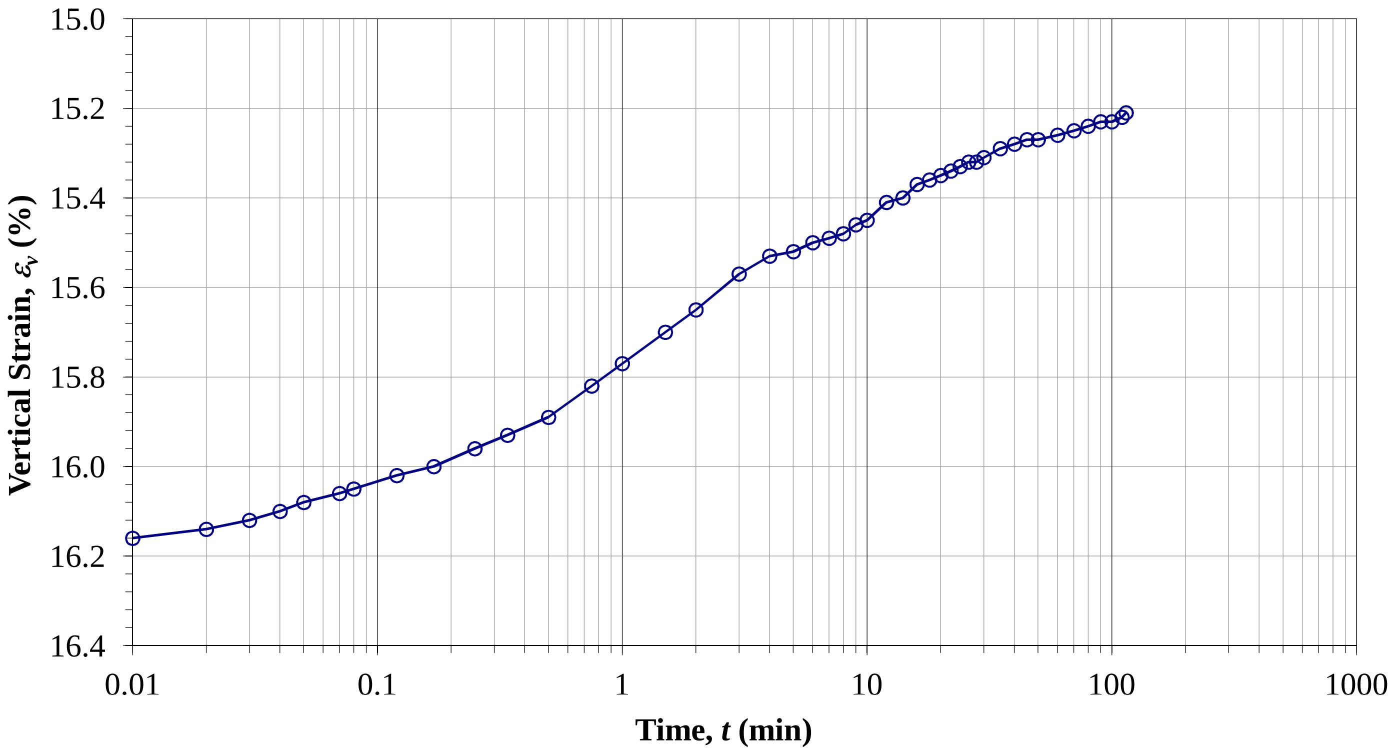
One-Dimensional Consolidation Properties of Soils

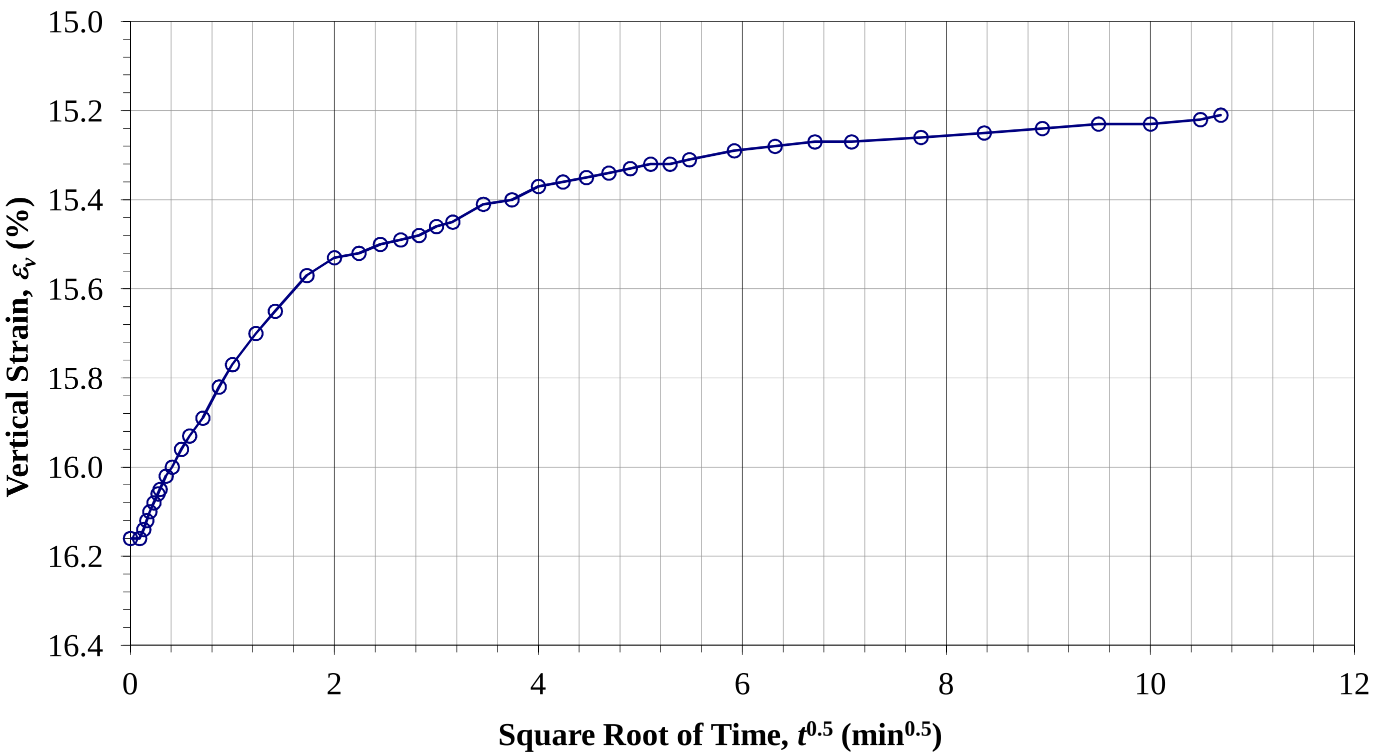
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-05
Sample:
Depth: 59.5'

Constant Load Step: 14 of 14
Stress: 400 psf





One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

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Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/27/2013
By: JDF

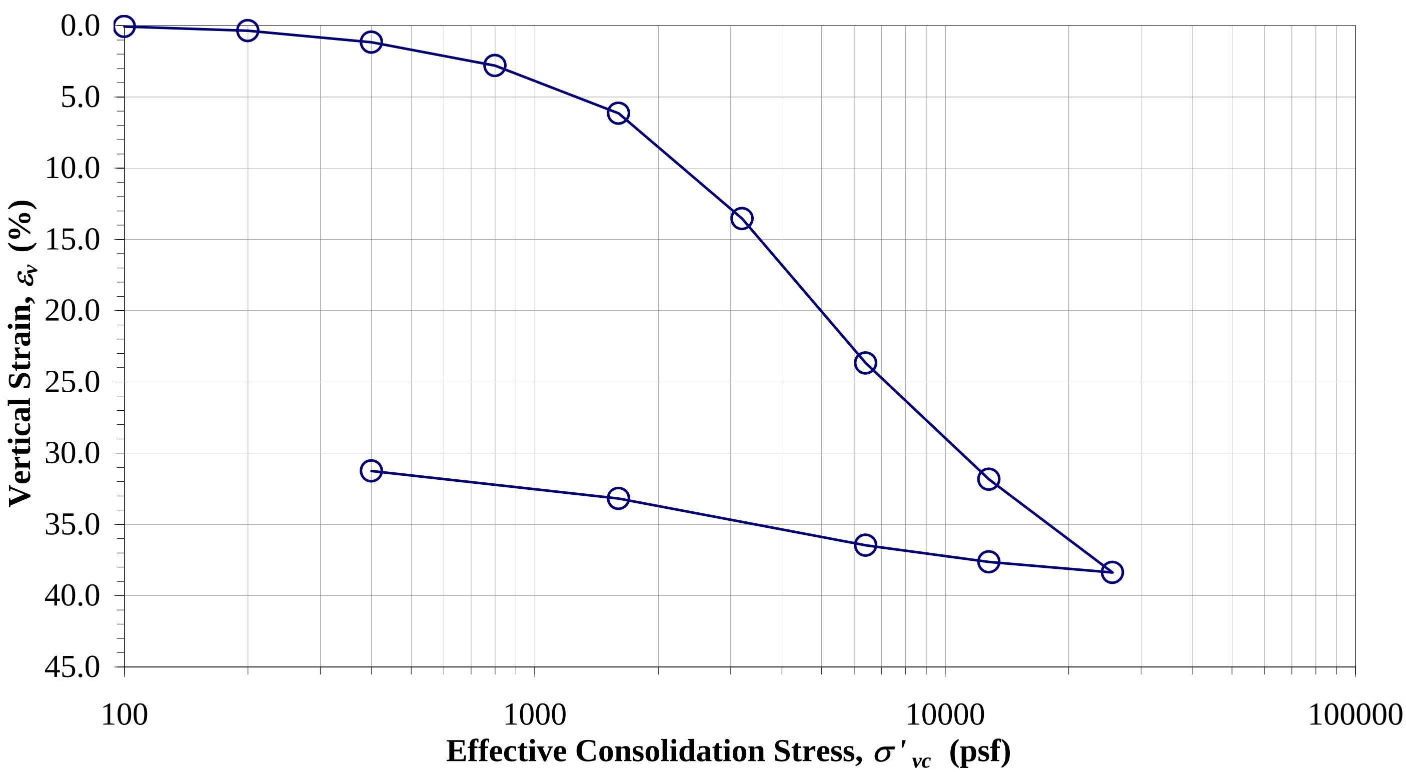
Boring No.: B-08
Sample:
Depth: 24.5'
Sample Description: Grey clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Test method:	B	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	1.0000
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	162.43	141.92
Wt. rings/tare (g)	44.98	44.98
Total unit wt., γ (pcf)	97.6	80.6
Wet soil + tare (g)	183.36	
Dry soil + tare (g)	159.53	
Tare (g)	127.13	
Water content, ω (%)	73.5	43.2
Dry unit wt., γ_d (pcf)	56.2	56.2
Saturation, S	1.00	0.59

*Note: C_v, C_c, C_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0000	0.00	1.0000	1.9639
100	0.0007	0.07	0.9993	1.9619
200	0.0035	0.35	0.9965	1.9535
400	0.0116	1.16	0.9884	1.9294
800	0.0282	2.82	0.9718	1.8804
1600	0.0616	6.16	0.9384	1.7814
3200	0.1354	13.54	0.8646	1.5626
6400	0.2368	23.68	0.7632	1.2621
12800	0.3183	31.83	0.6817	1.0205
25600	0.3838	38.38	0.6162	0.8264
12800	0.3762	37.62	0.6238	0.8489
6400	0.3646	36.46	0.6354	0.8833
1600	0.3319	33.19	0.6681	0.9802
400	0.3125	31.25	0.6875	1.0377
0	0.0000	0.00	1.0000	1.9639



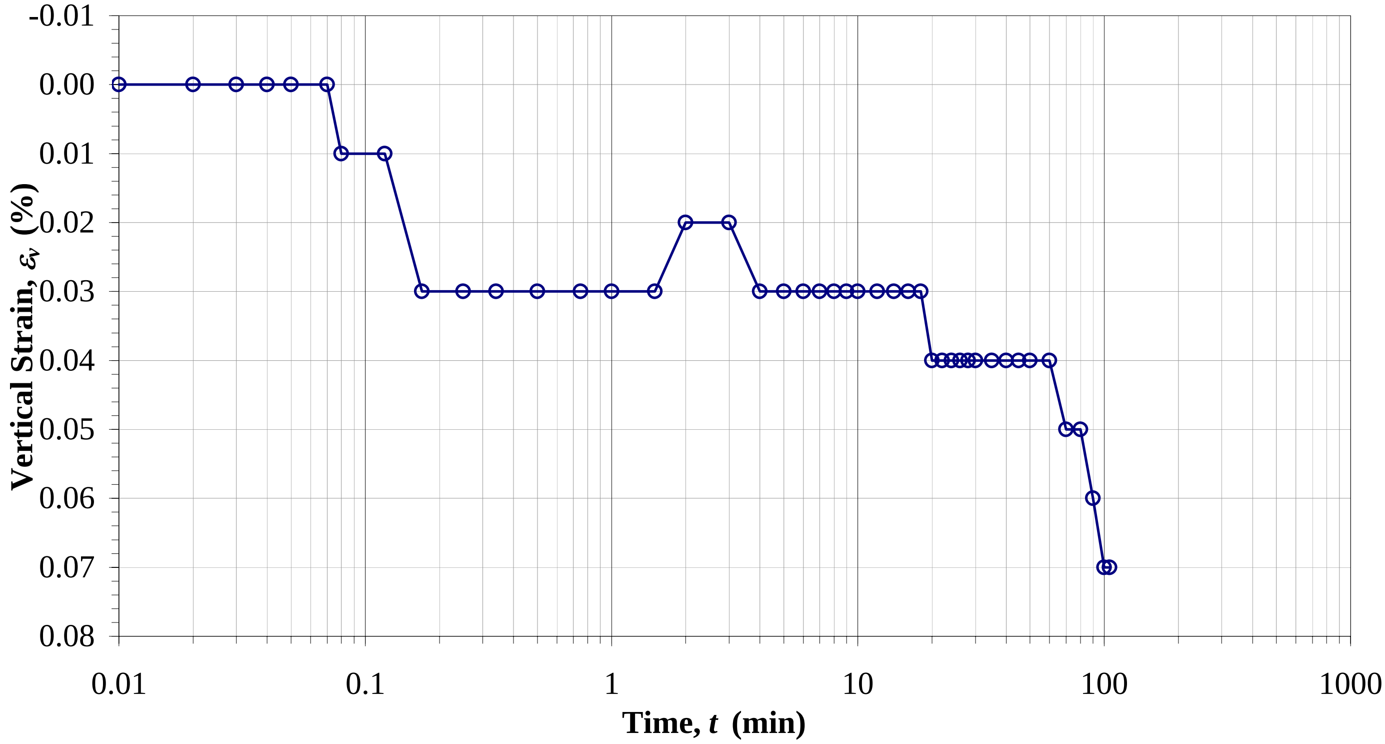
Entered: ________
Reviewed: ________

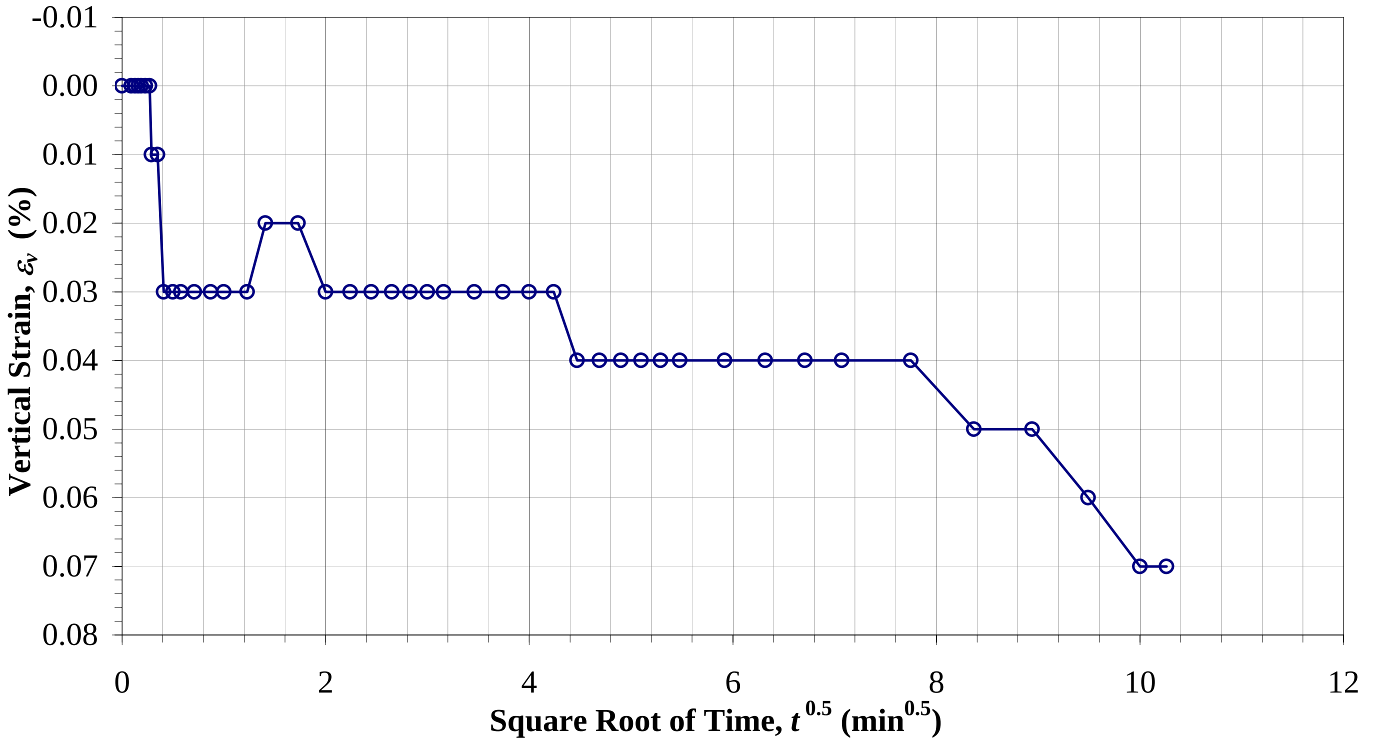
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-08
Sample:
Depth: 24.5'

Constant Load Step: 1 of 13
Stress: 100 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP

No: 00823-012

Location: Logan, Utah

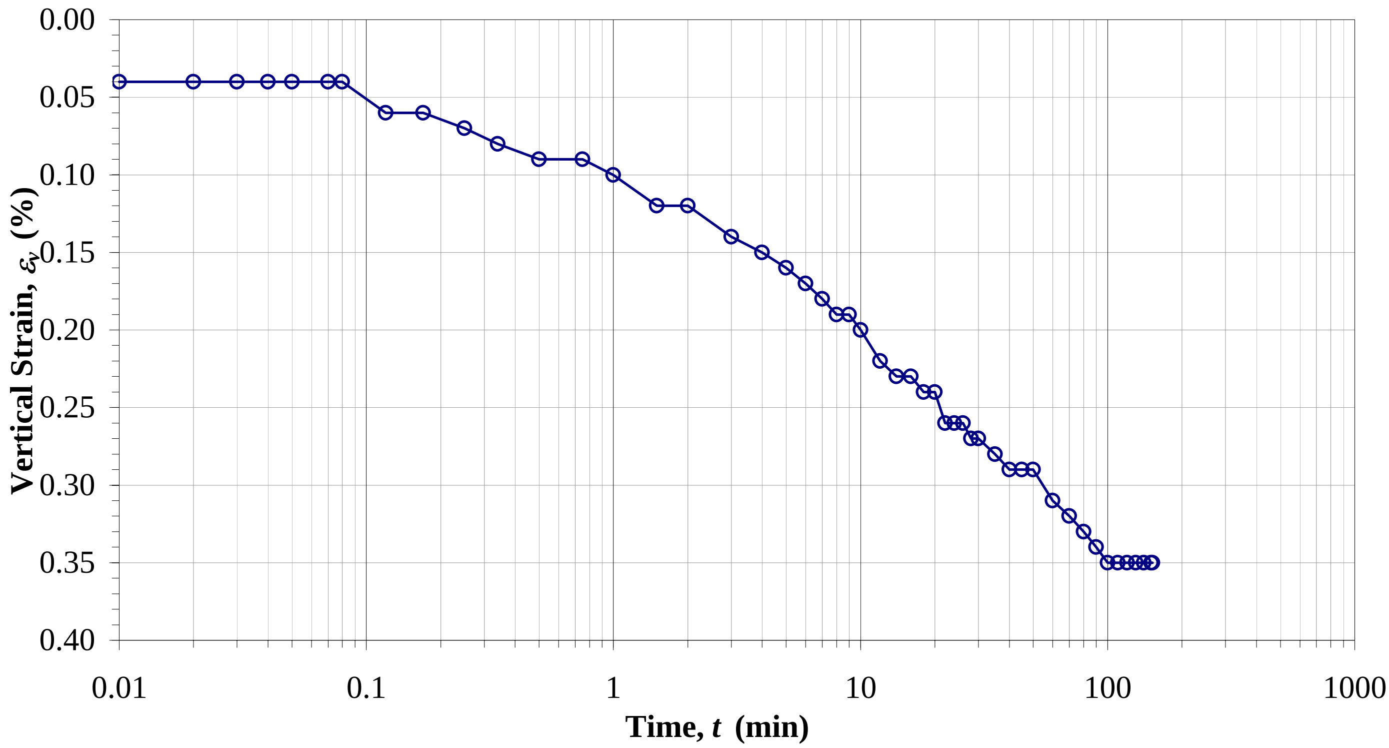
Boring No.: B-08

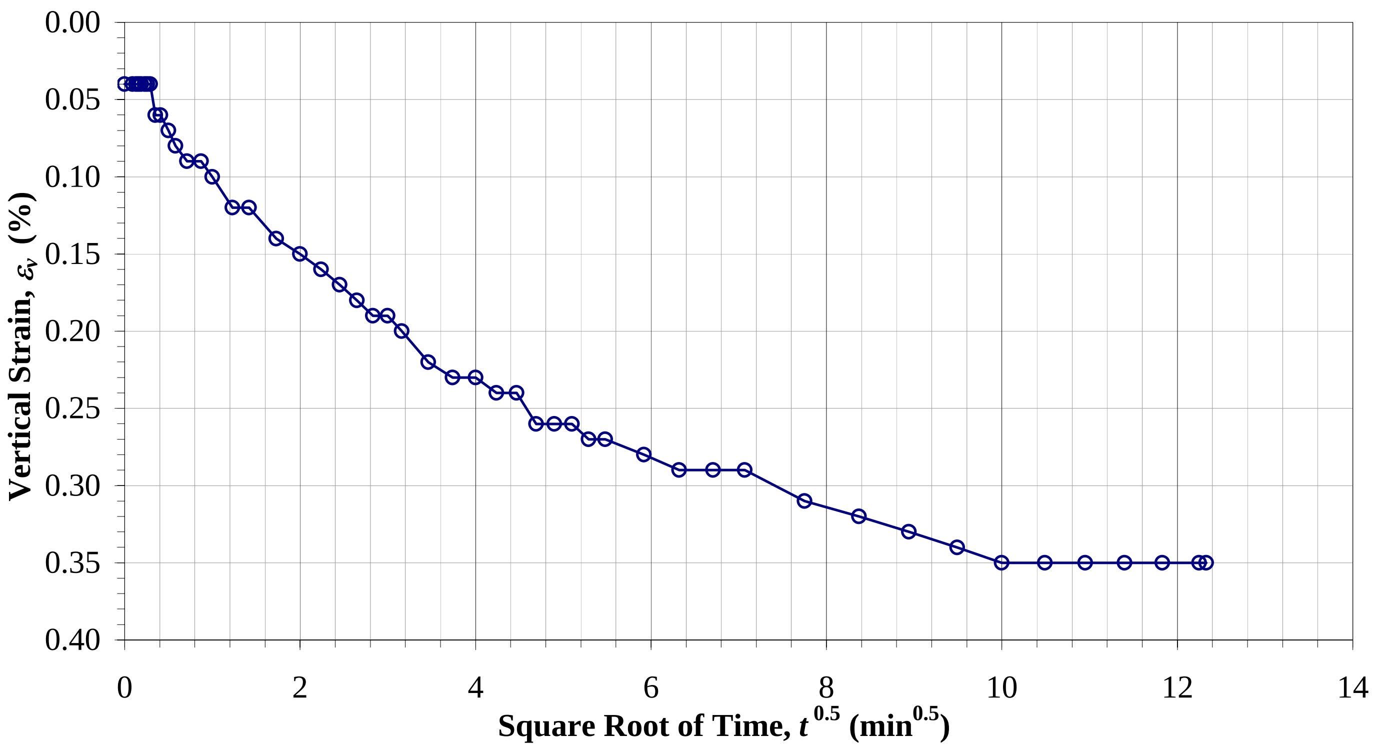
Sample:

Depth: 24.5'

Constant Load Step: 2 of 13

Stress: 200 psf





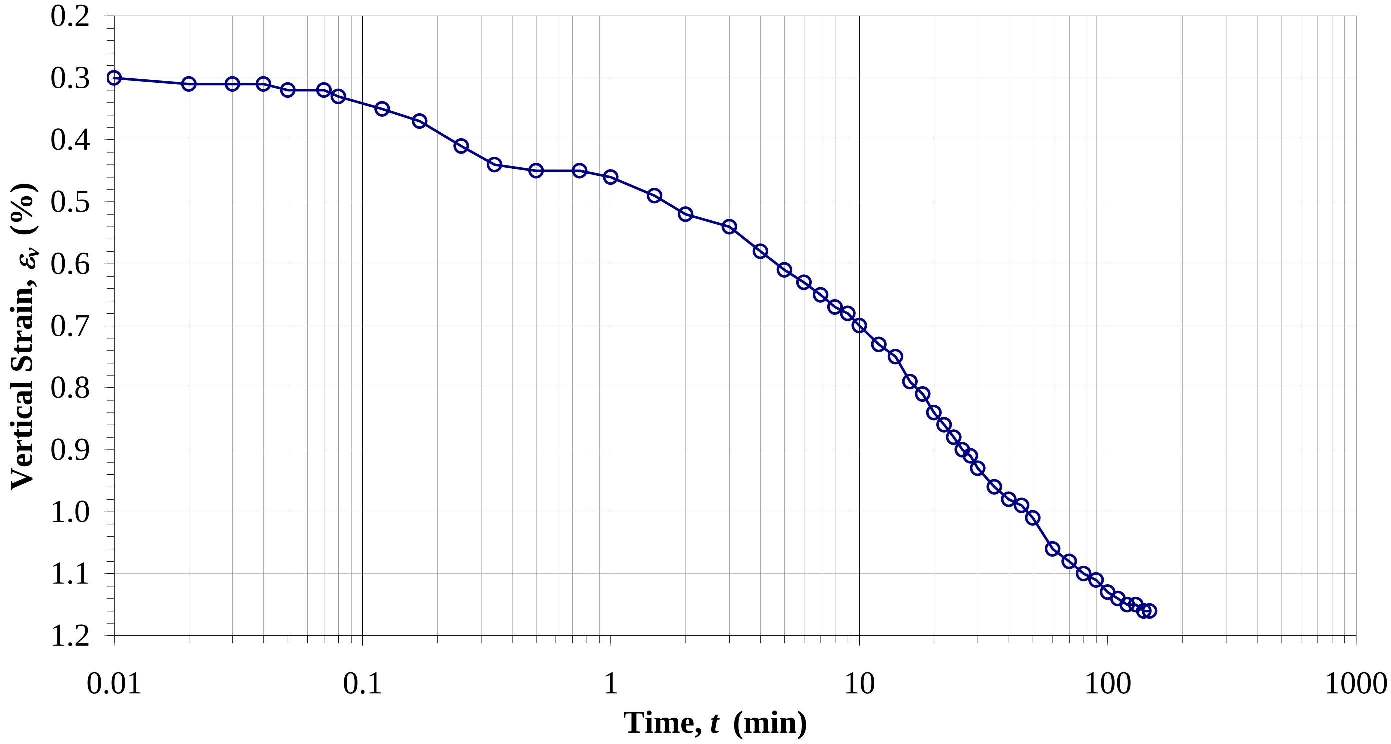
One-Dimensional Consolidation Properties of Soils

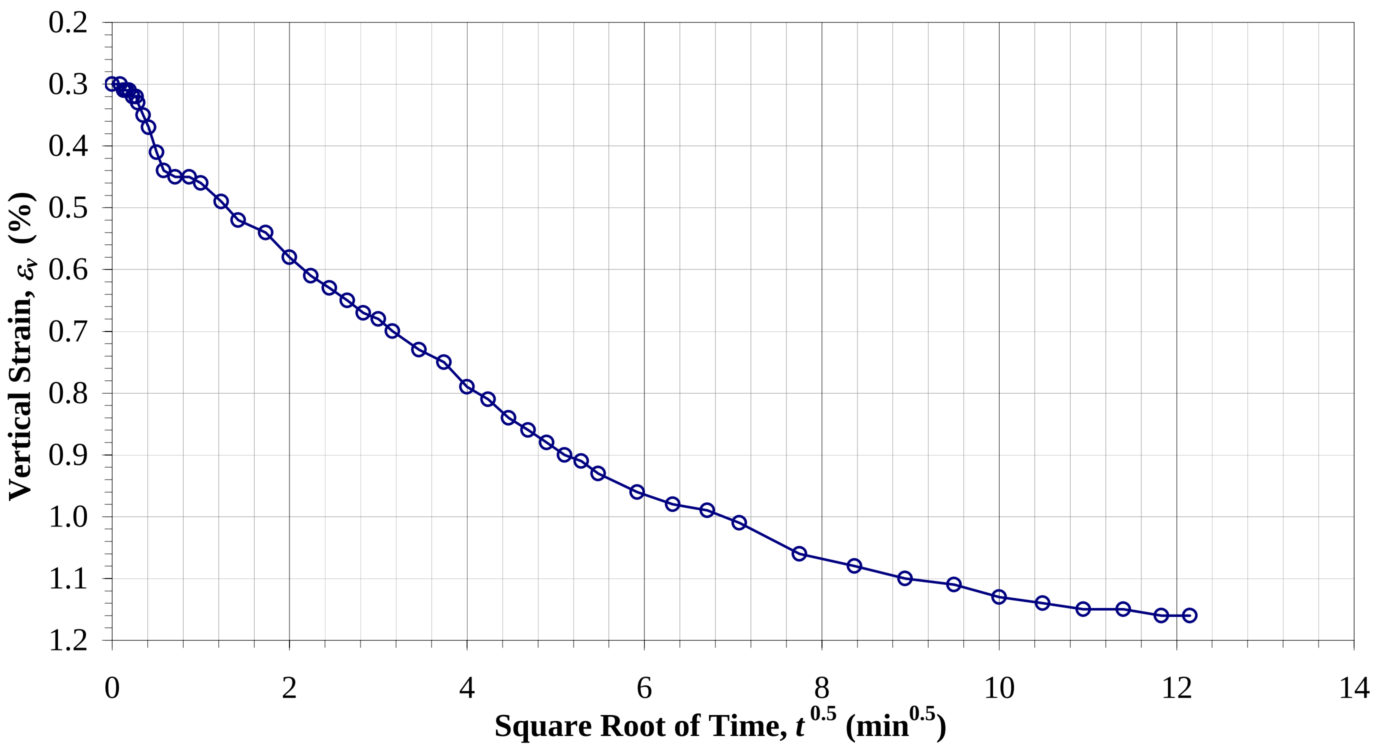
(ASTM D2435)

Project: Logan WWTP | **Boring No.:** B-08
No: 00823-012 | **Sample:**
Location: Logan, Utah | **Depth:** 24.5'

Constant Load Step: 3 of 13

Stress: 400 psf





One-Dimensional Consolidation Properties of Soils

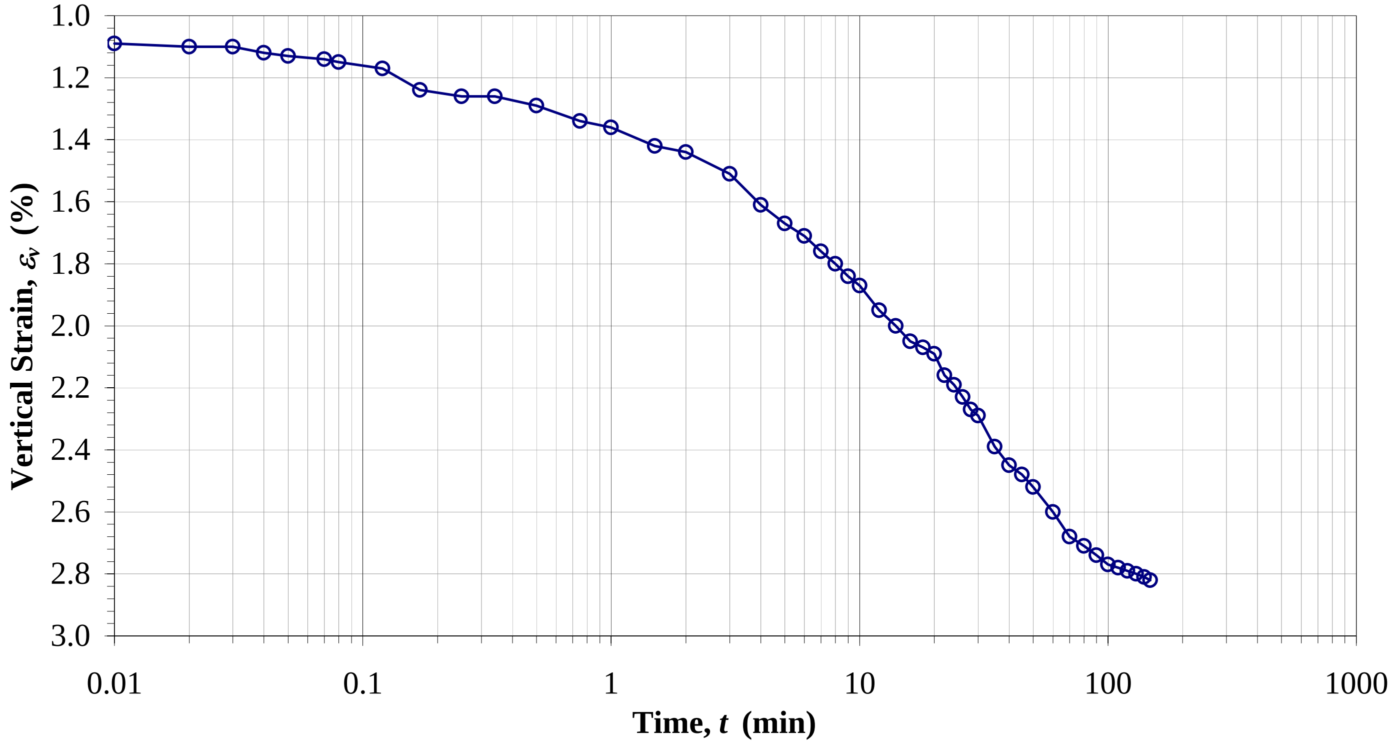
(ASTM D2435)

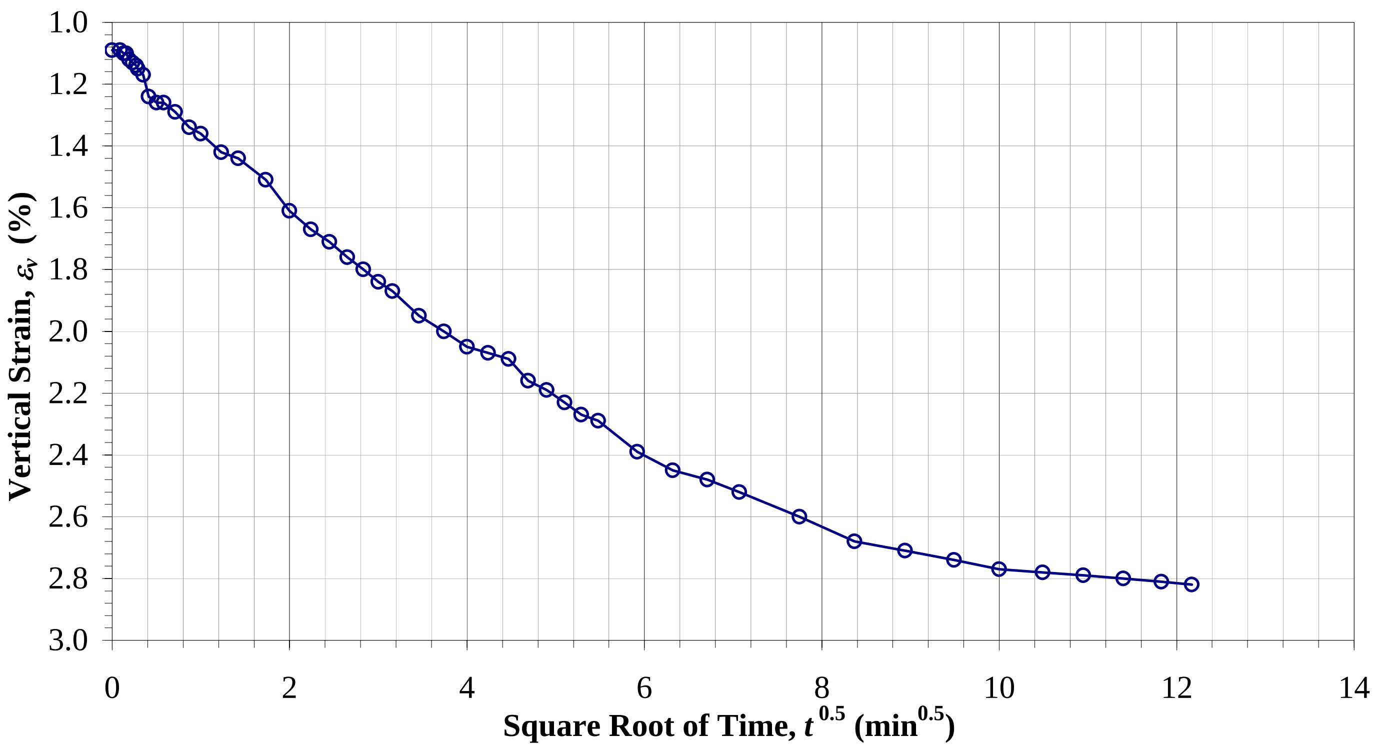
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-08
Sample:
Depth: 24.5'

Constant Load Step: 4 of 13

Stress: 800 psf





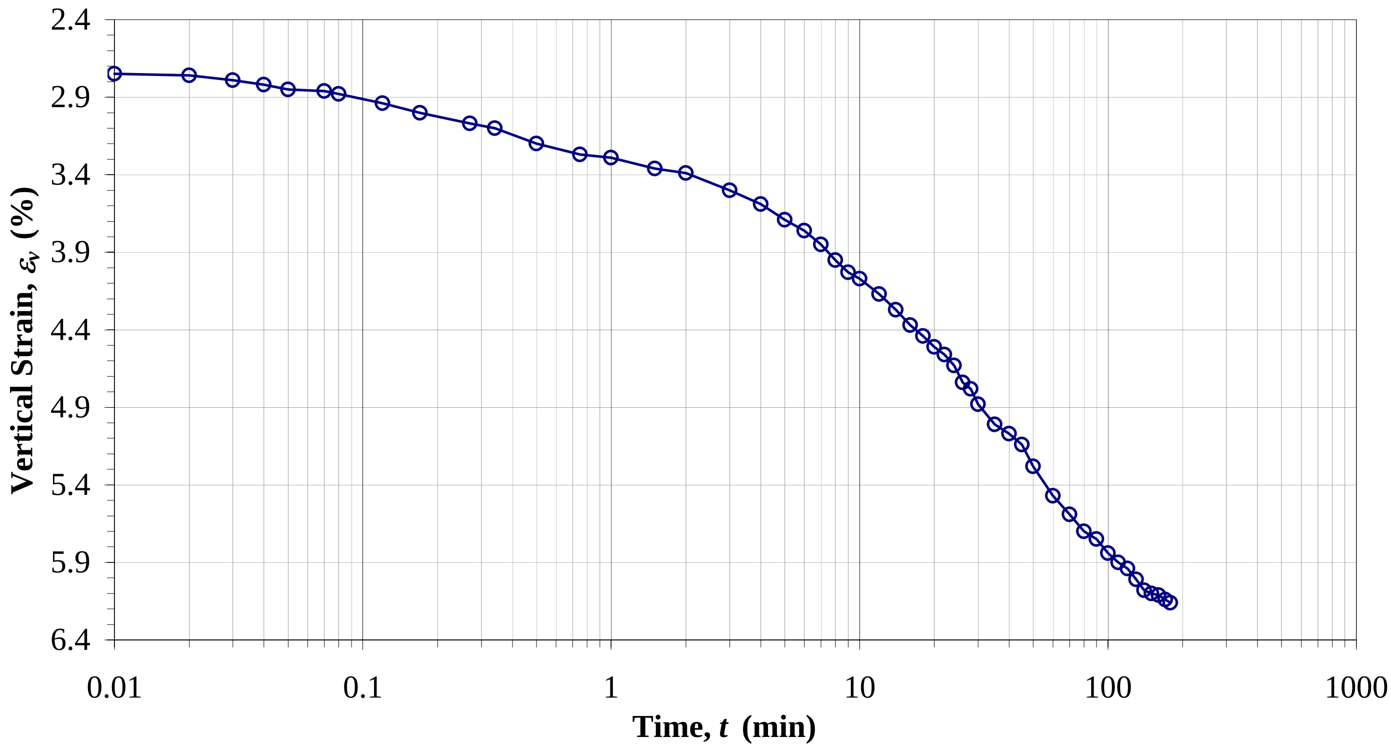
One-Dimensional Consolidation Properties of Soils

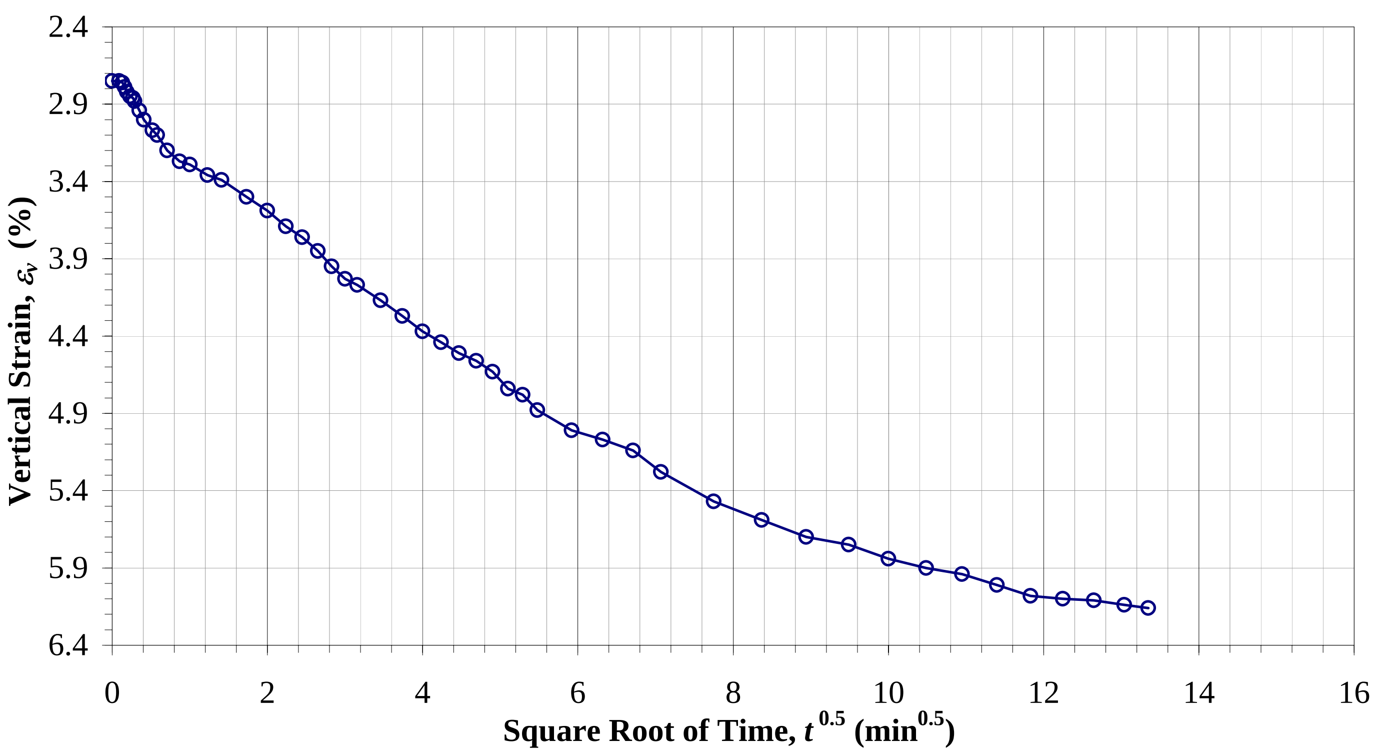
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-08
Sample:
Depth: 24.5'

Constant Load Step: 5 of 13
Stress: 1600 psf



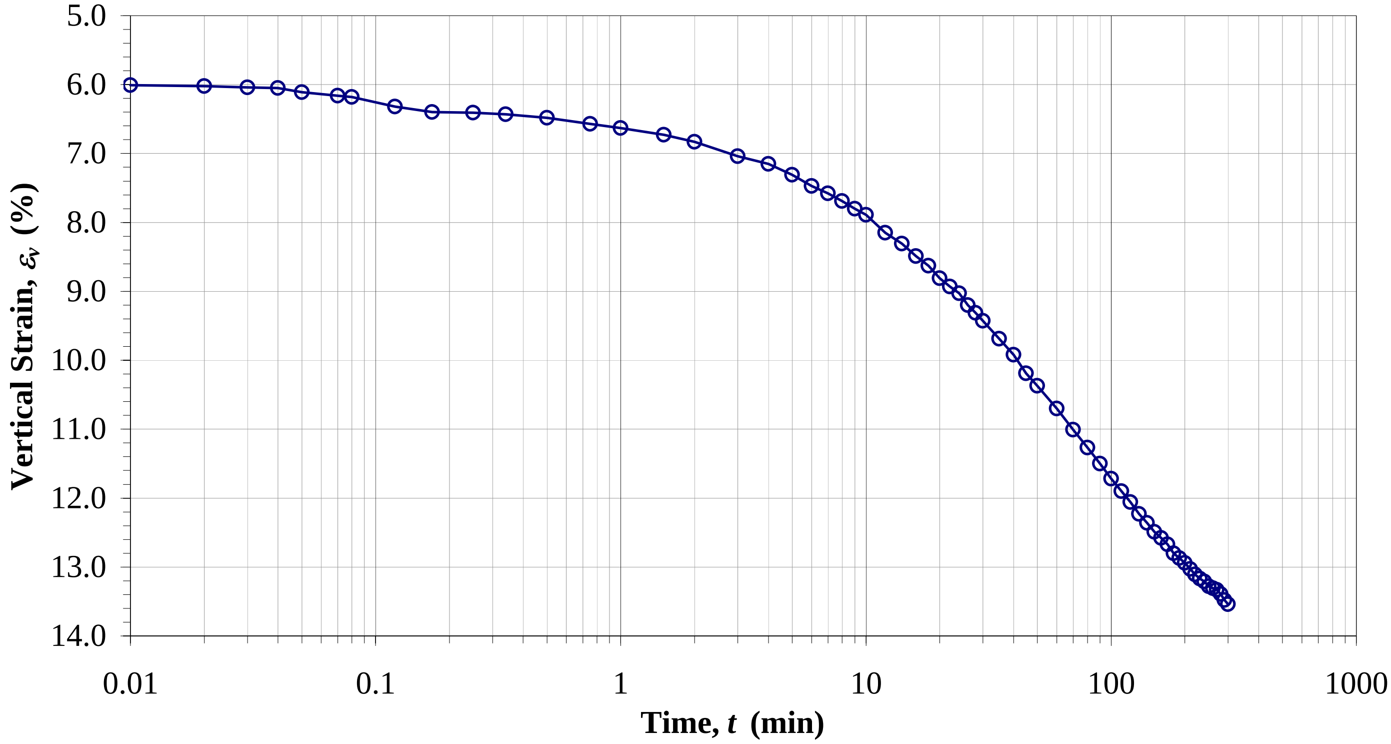


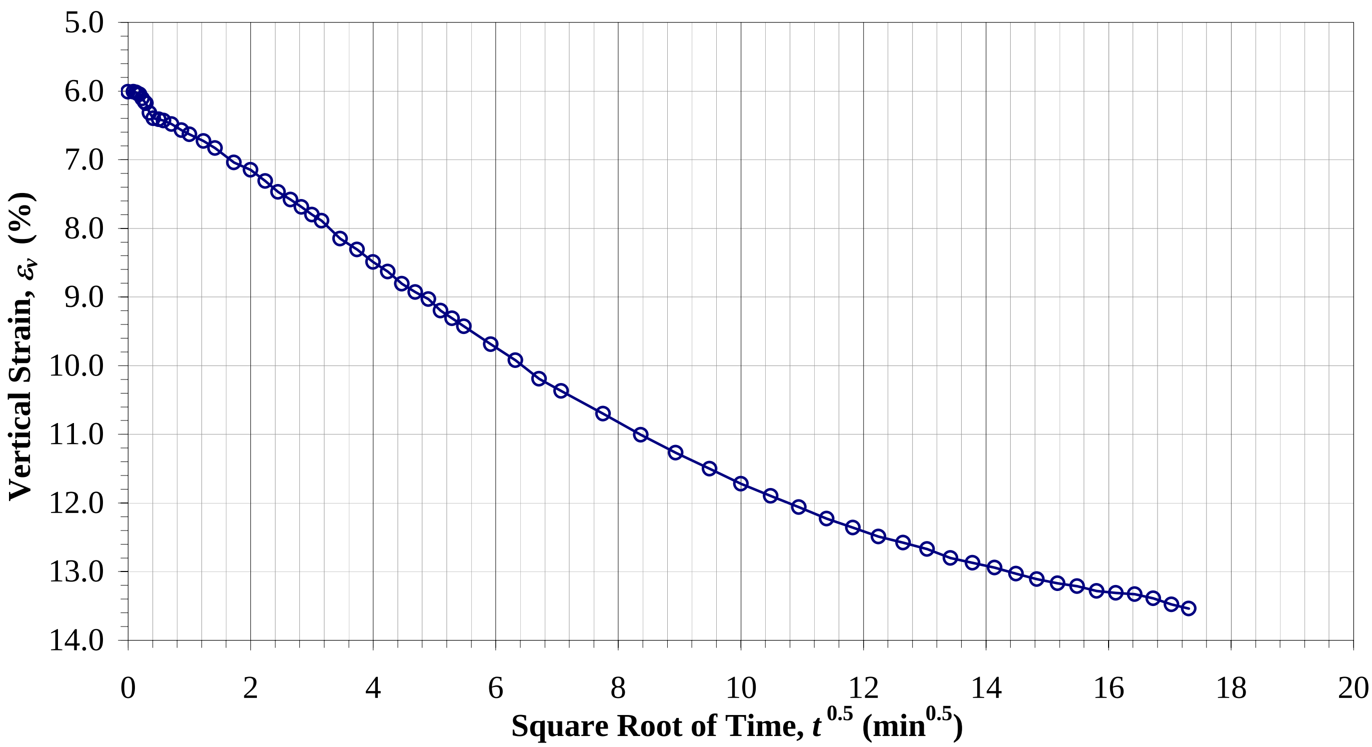
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-08
Sample:
Depth: 24.5'

Constant Load Step: 6 of 13
Stress: 3200 psf



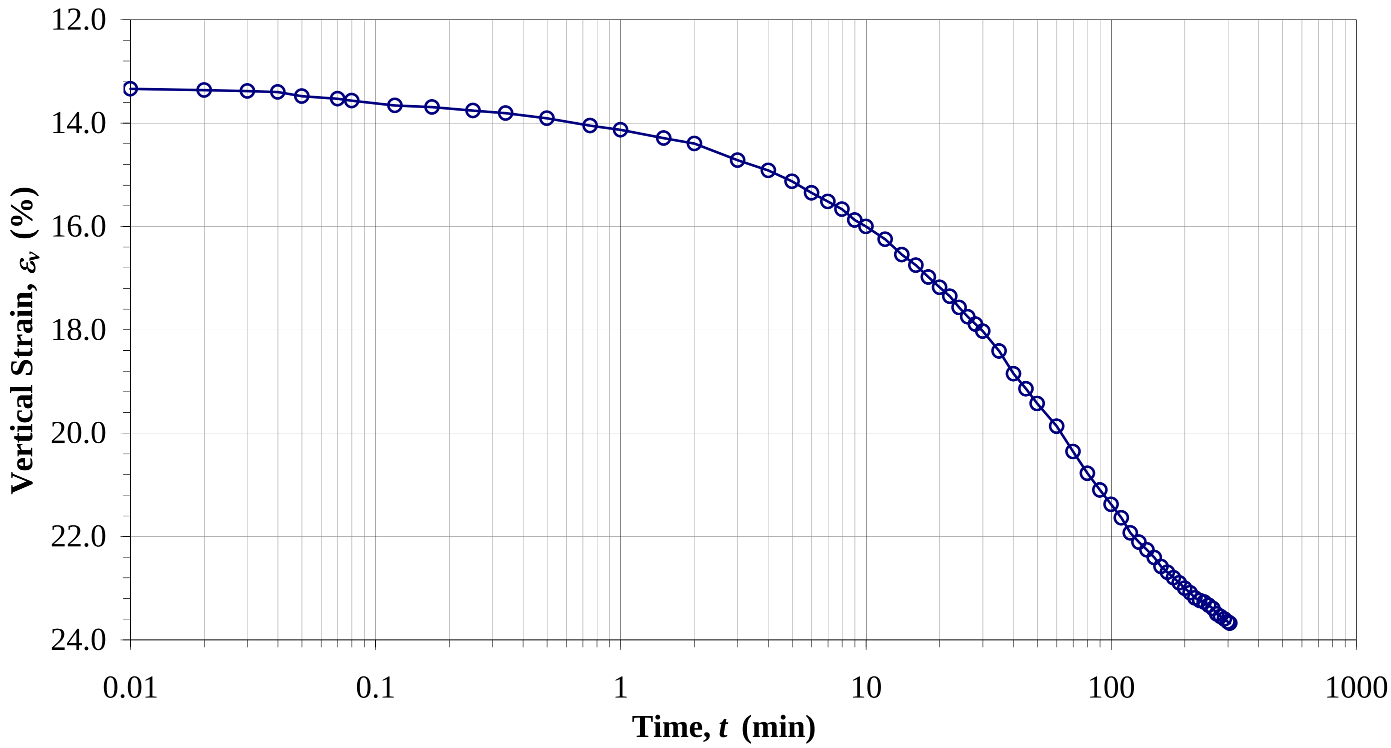


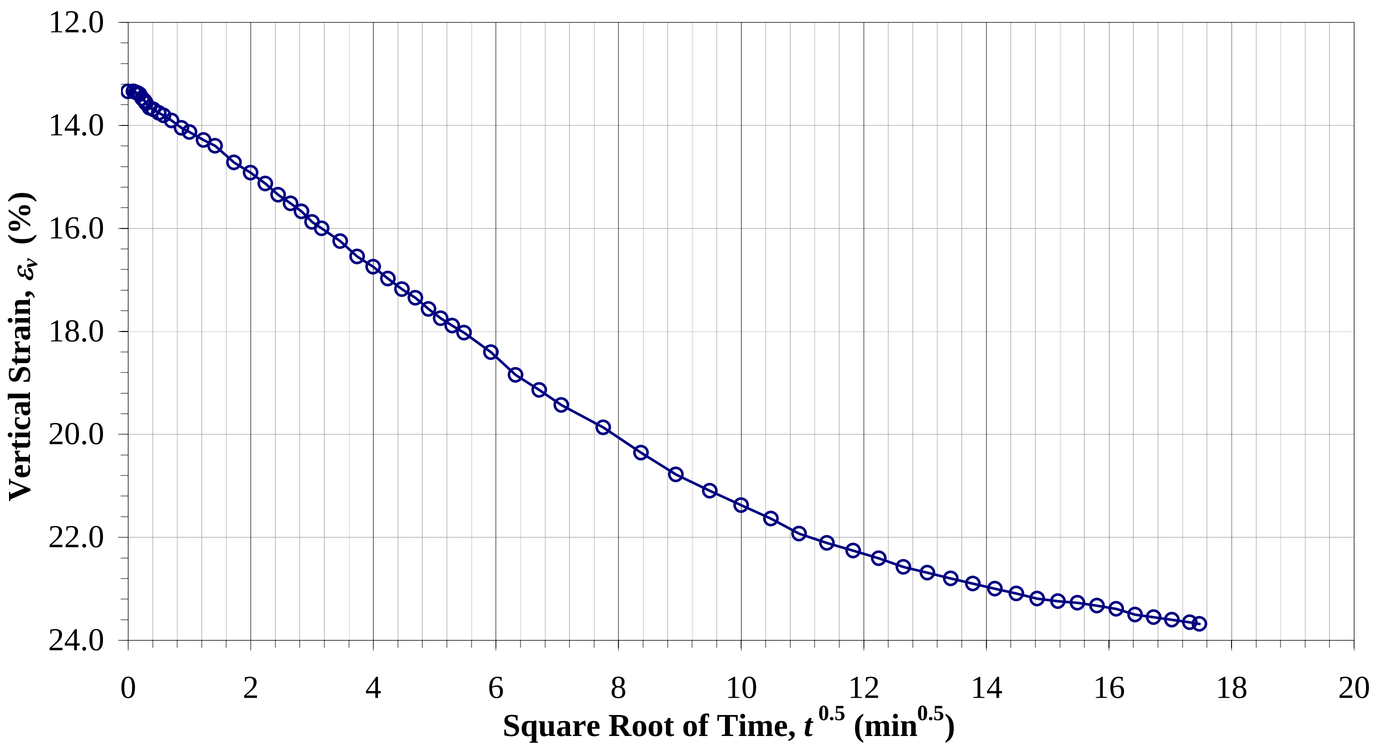
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-08
Sample:
Depth: 24.5'

Constant Load Step: 7 of 13
Stress: 6400 psf





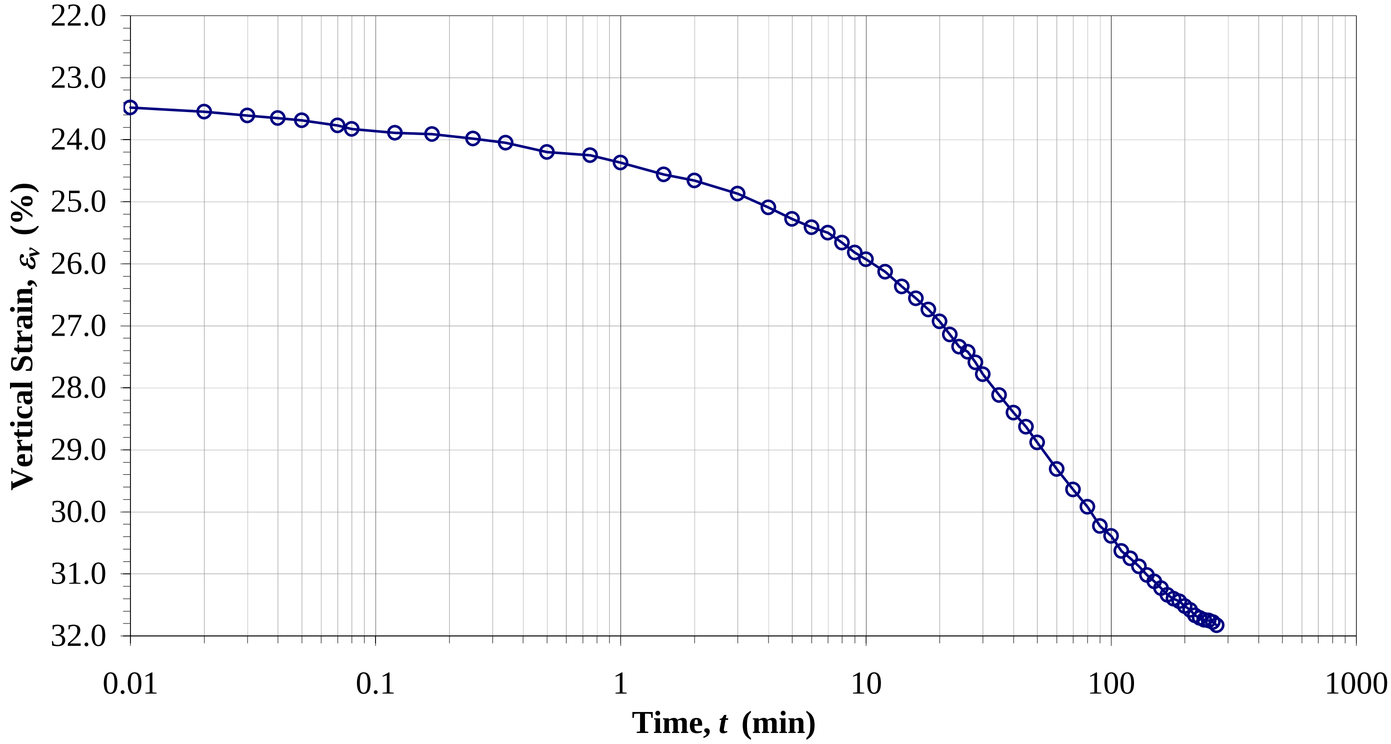
One-Dimensional Consolidation Properties of Soils

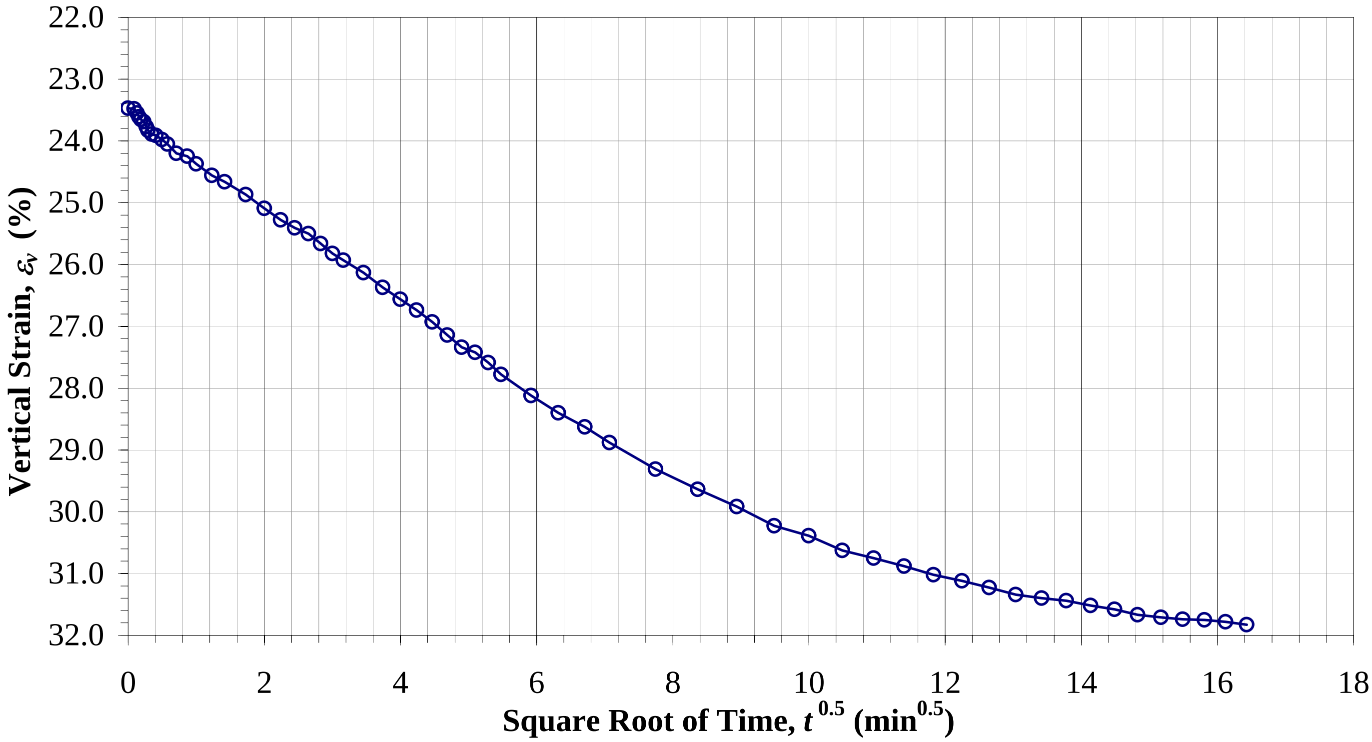
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-08
Sample:
Depth: 24.5'

Constant Load Step: 8 of 13
Stress: 12800 psf



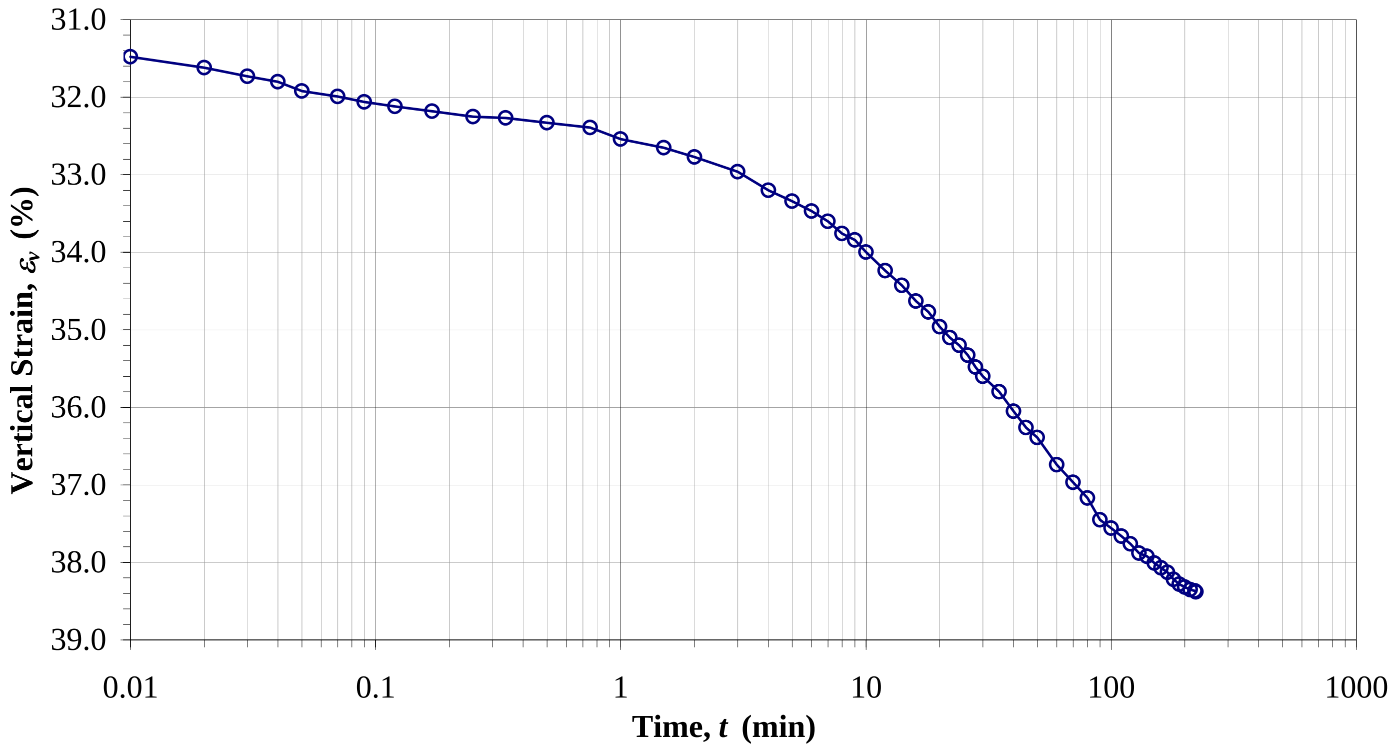


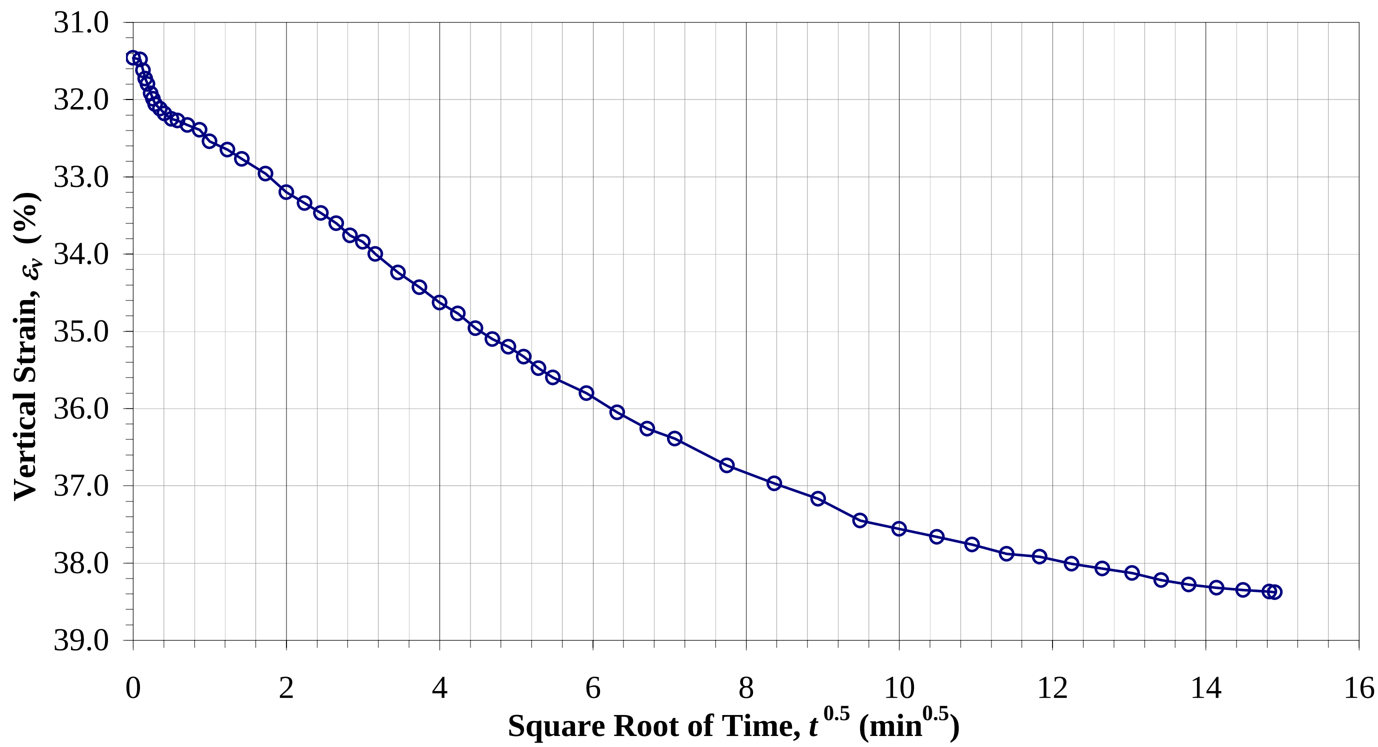
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-08
Sample:
Depth: 24.5'

Constant Load Step: 9 of 13
Stress: 25600 psf





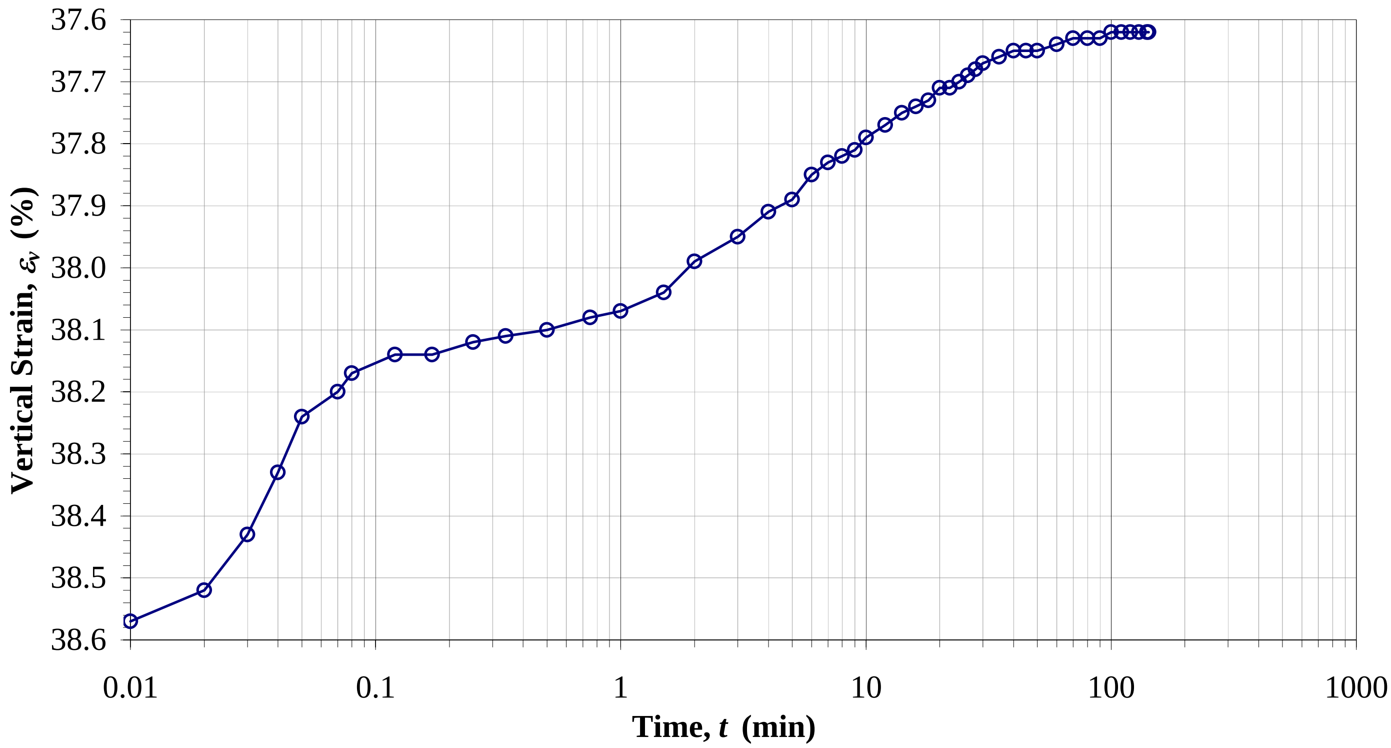
One-Dimensional Consolidation Properties of Soils

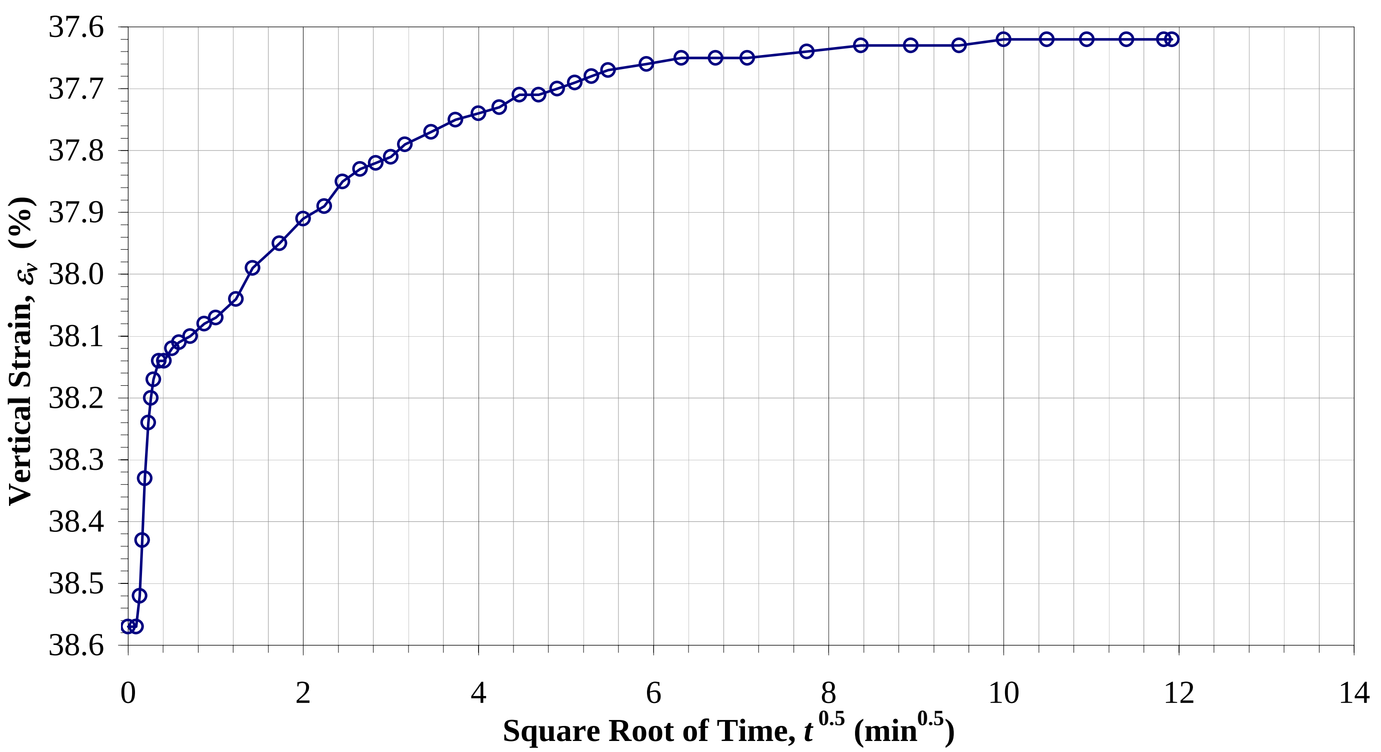
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-08
Sample:
Depth: 24.5'

Constant Load Step: 10 of 13
Stress: 12800 psf





One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

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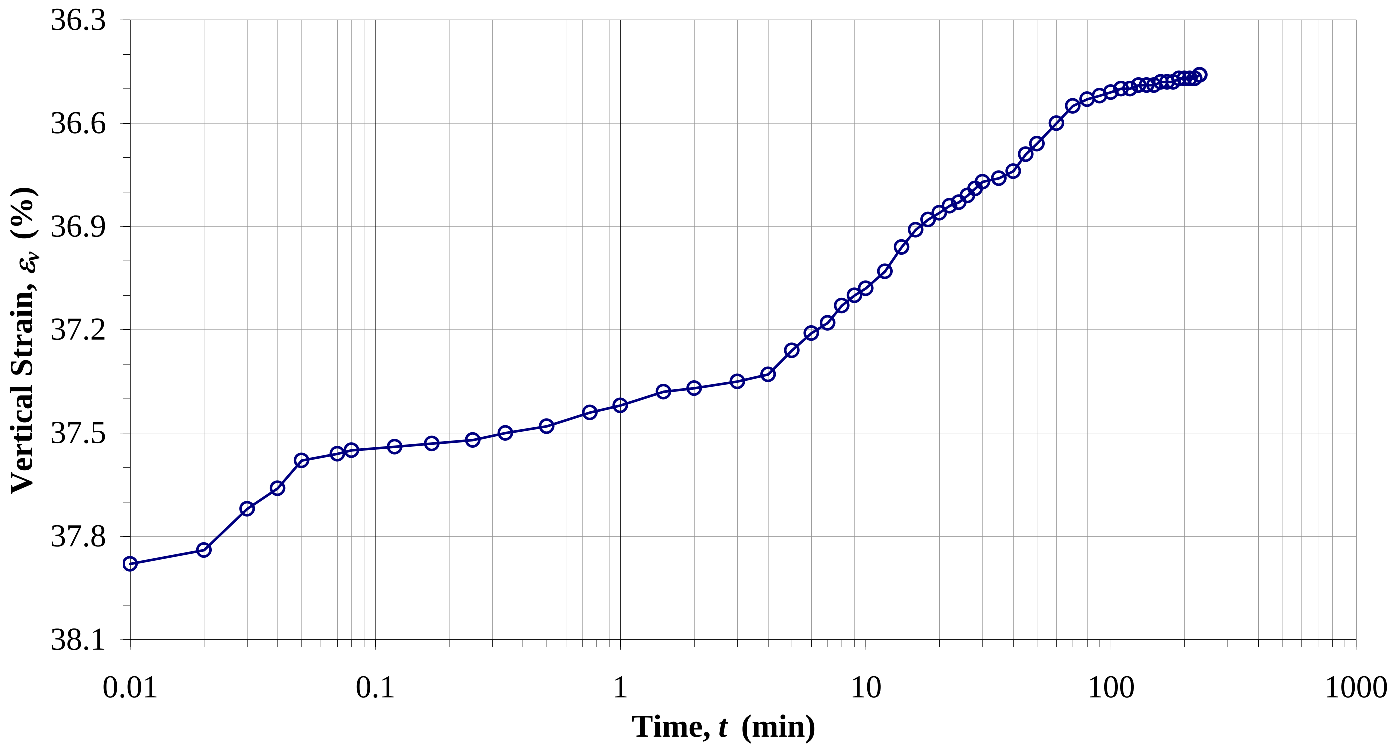
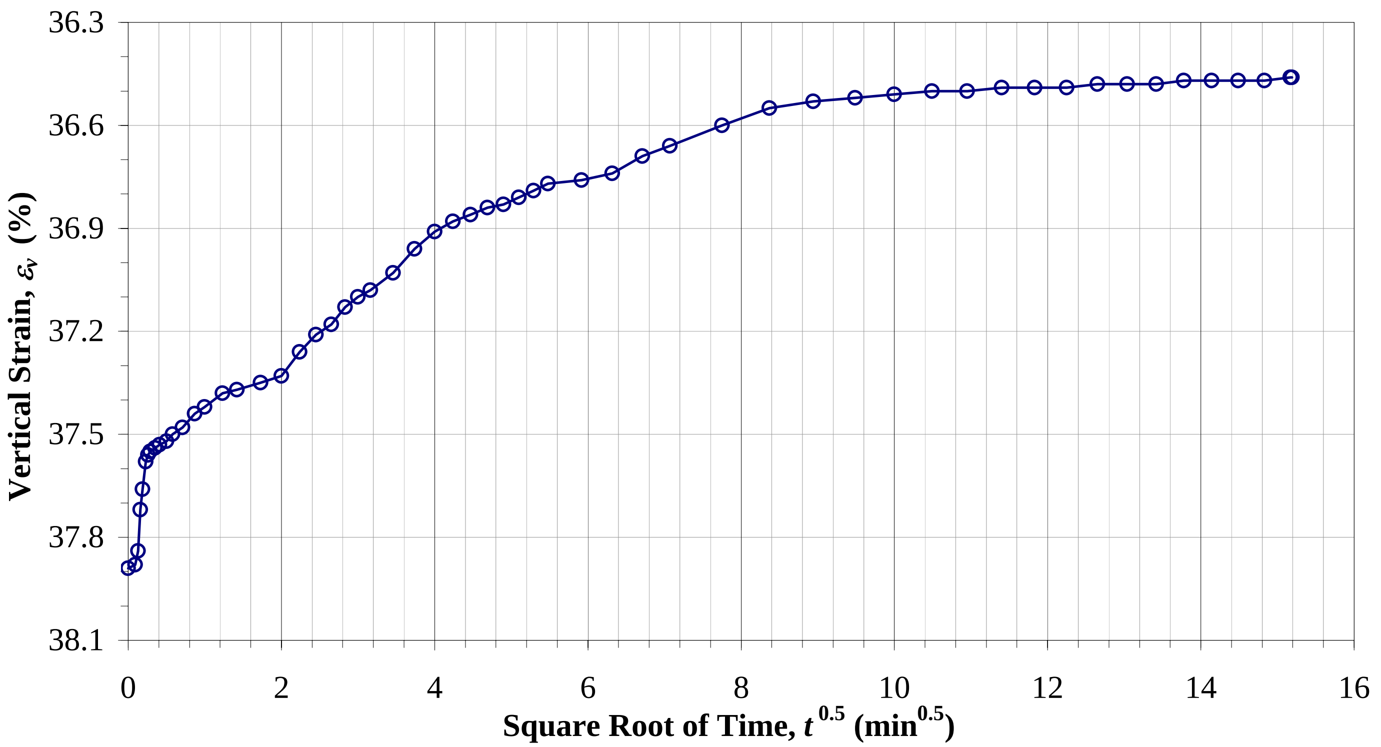
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-08
Sample:
Depth: 24.5'

Constant Load Step: 11 of 13
Stress: 6400 psf





One-Dimensional Consolidation Properties of Soils

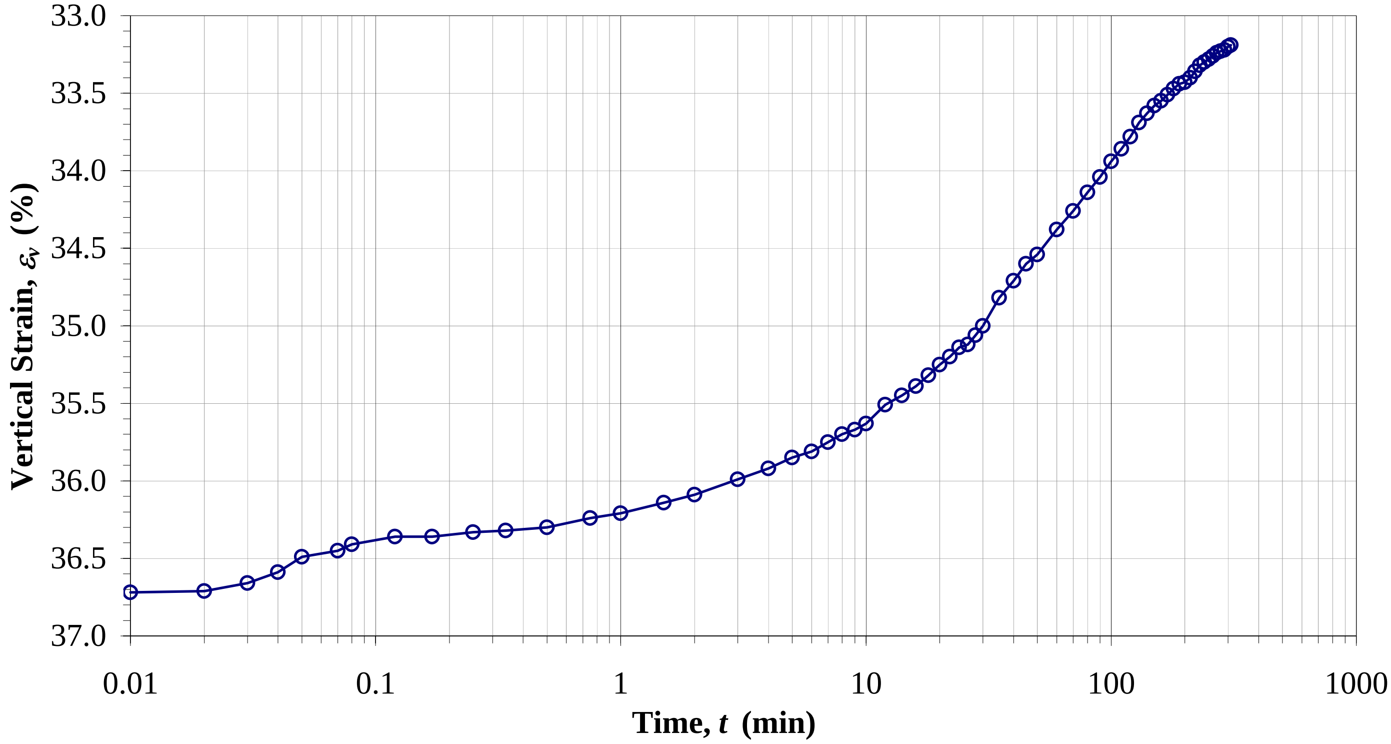
(ASTM D2435)

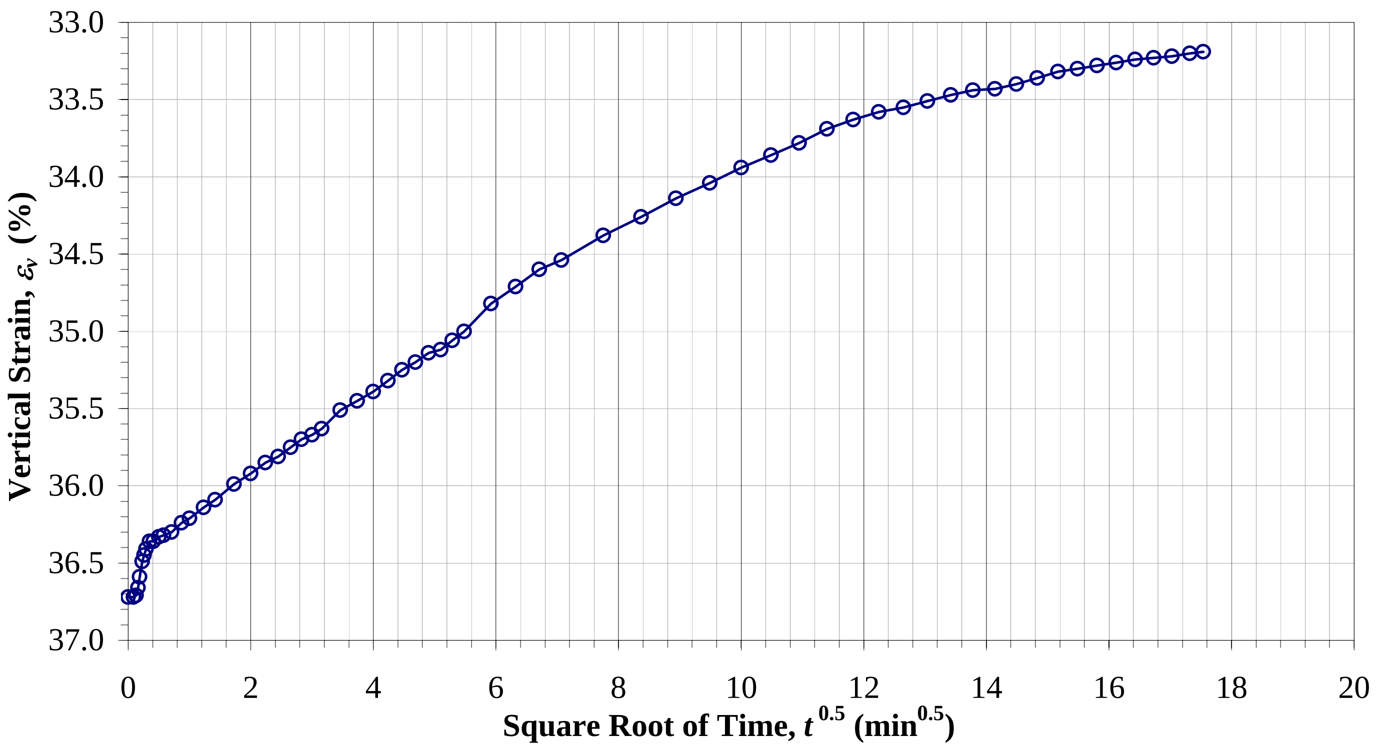
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-08
Sample:
Depth: 24.5'

Constant Load Step: 12 of 13

Stress: 1600 psf





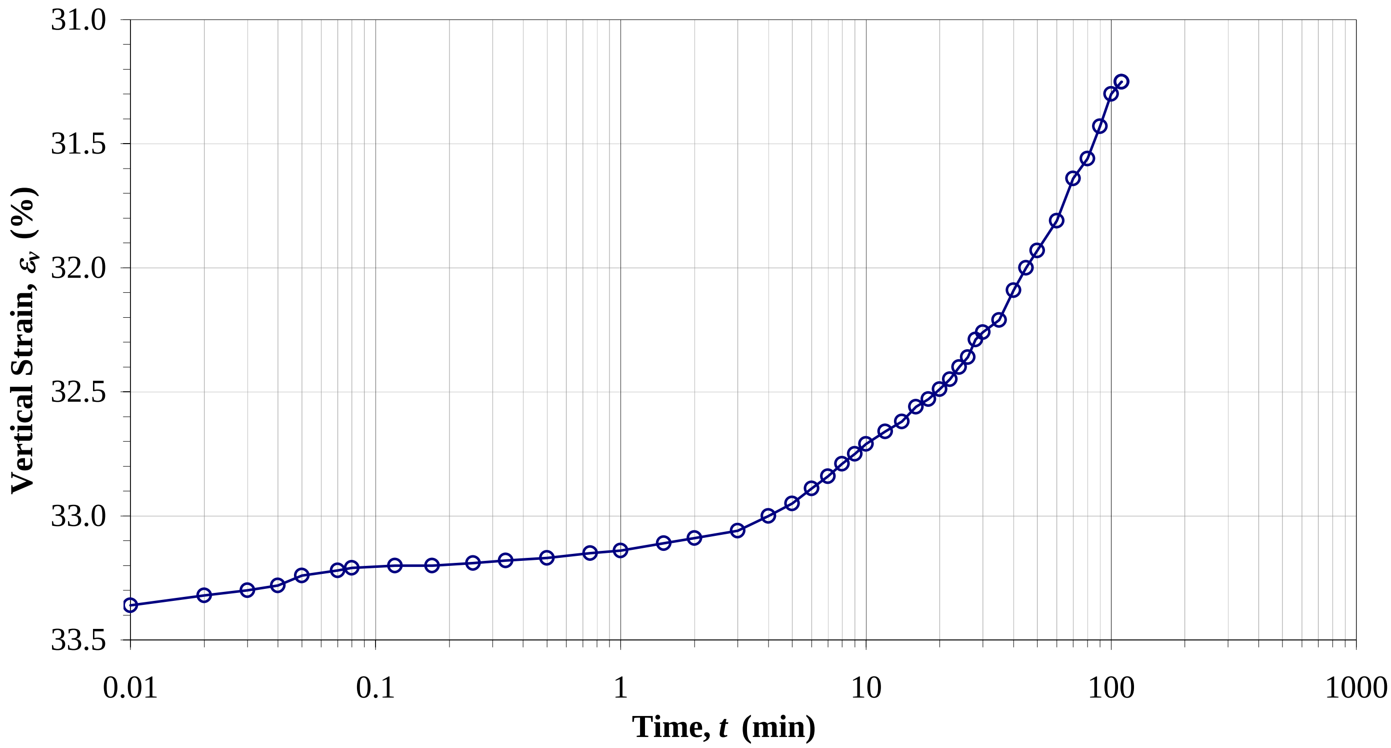
One-Dimensional Consolidation Properties of Soils

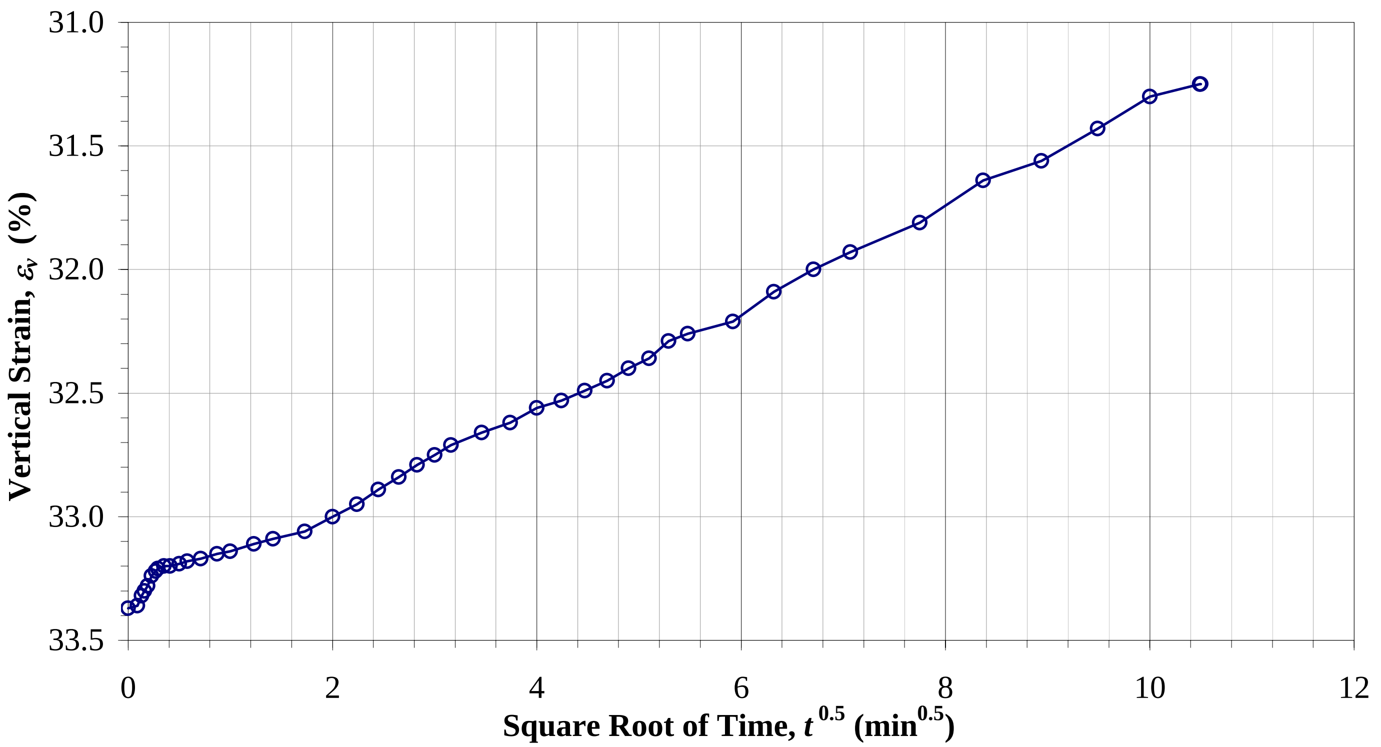
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-08
Sample:
Depth: 24.5'

Constant Load Step: 13 of 13
Stress: 400 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

IGES

Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah
Date: 2/27/2013
By: JDF

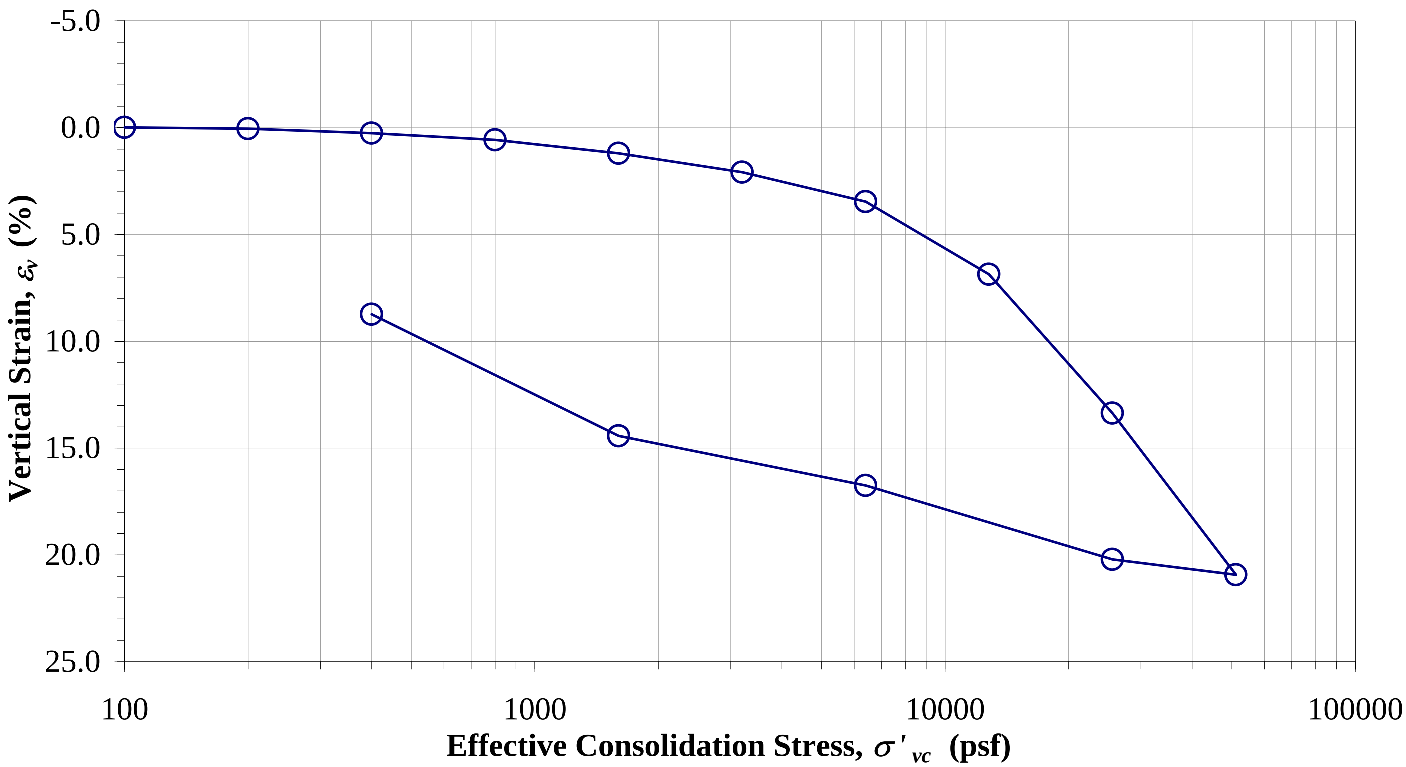
Boring No.: **B-09**
Sample:
Depth: **14.5'**
Sample Description: Grey/brown clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from Shelby tube

Test method:	B	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9126
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	178.56	173.74
Wt. rings/tare (g)	42.75	42.75
Total unit wt., γ (pcf)	112.9	119.3
Wet soil + tare (g)	466.39	
Dry soil + tare (g)	364.90	
Tare (g)	128.28	
Water content, ω (%)	42.9	37.8
Dry unit wt., γ_d (pcf)	79.0	86.5
Saturation, S	1.00	1.00

*Note: C_v, C_c, C_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0000	0.00	1.0000	1.1104
100	-0.0001	-0.01	1.0001	1.1106
200	0.0004	0.04	0.9996	1.1095
400	0.0026	0.26	0.9974	1.1050
800	0.0057	0.57	0.9943	1.0983
1600	0.0120	1.20	0.9880	1.0851
3200	0.0209	2.09	0.9791	1.0664
6400	0.0346	3.46	0.9654	1.0375
12800	0.0686	6.86	0.9314	0.9656
25600	0.1336	13.36	0.8664	0.8285
51200	0.2092	20.92	0.7908	0.6689
25600	0.2021	20.21	0.7979	0.6839
6400	0.1674	16.74	0.8326	0.7571
1600	0.1442	14.42	0.8558	0.8061
400	0.0874	8.74	0.9126	0.9260



Comments: Specimen swelled upon inundation and at the 100 psf loading.

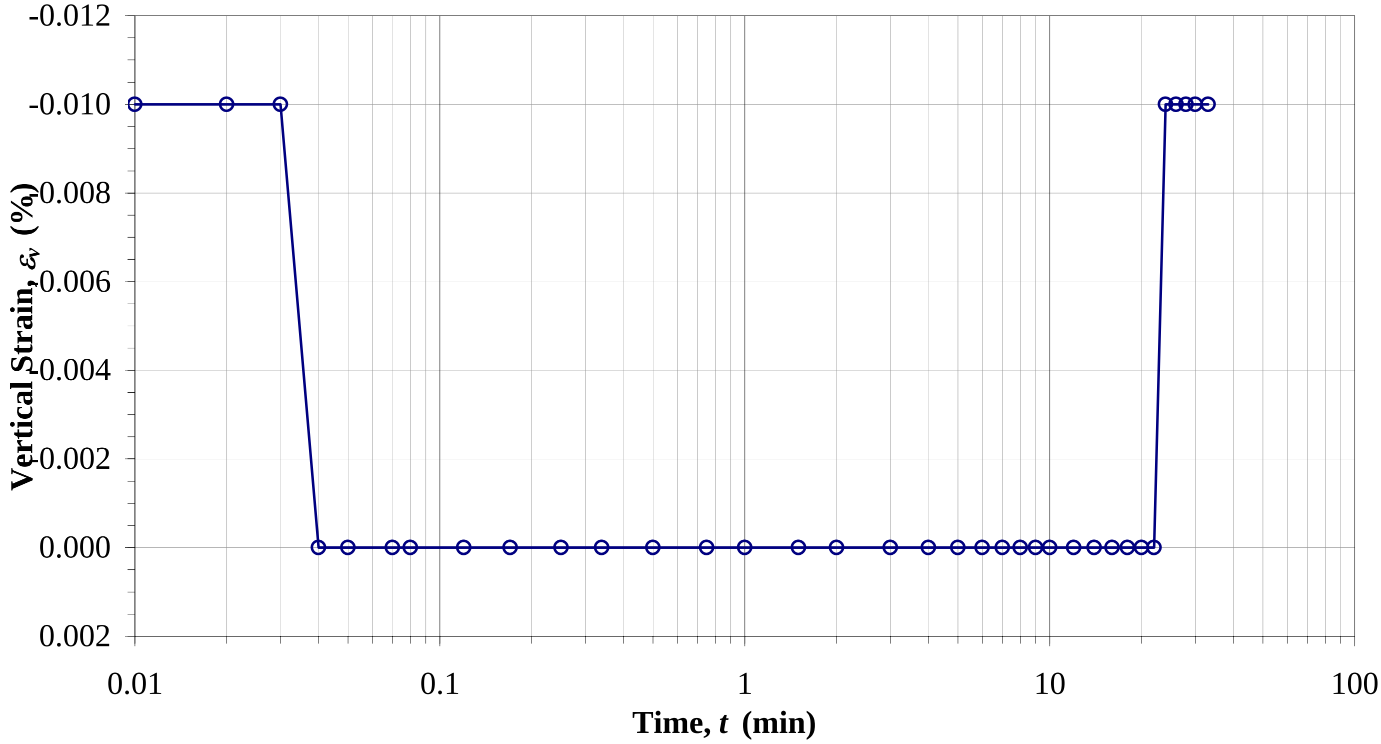
Entered: ________
Reviewed: ________

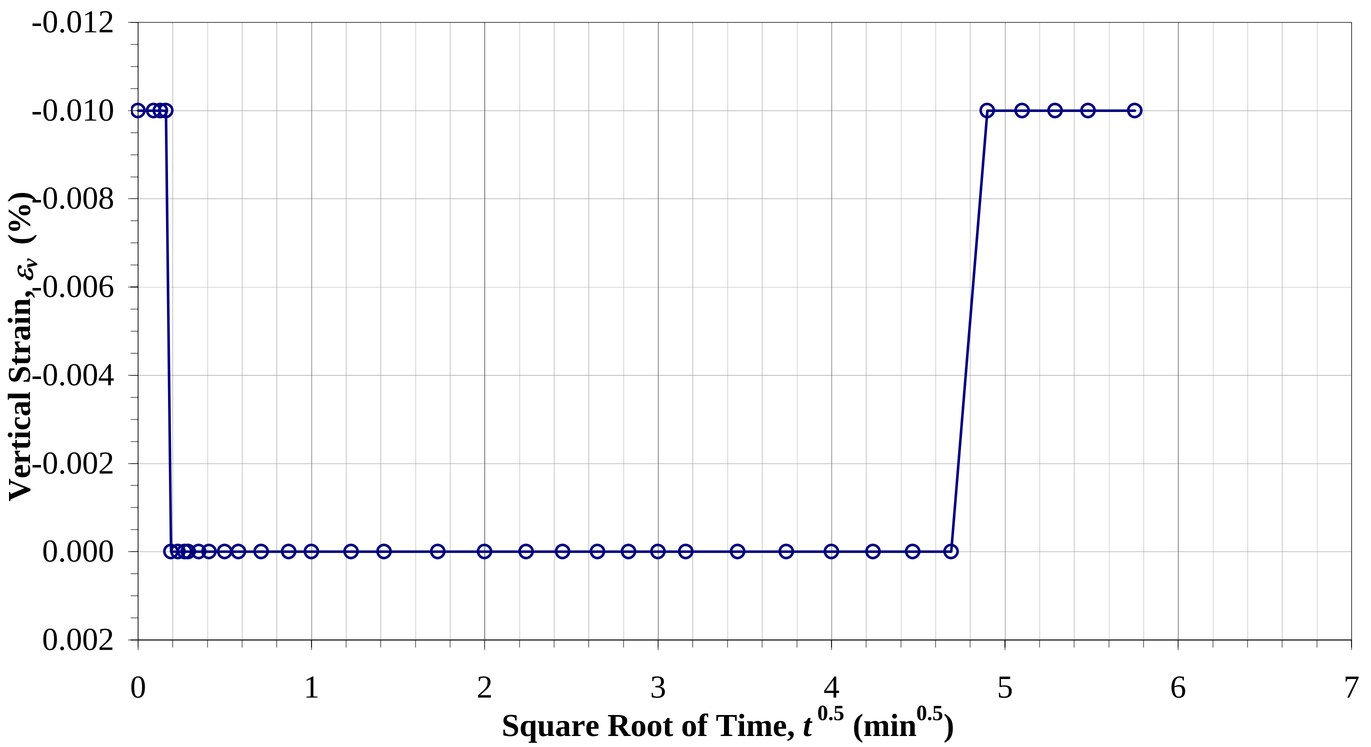
<u>One-Dimensional Consolidation Properties of Soils</u>
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 14.5'

Constant Load Step: 1 of 14
Stress: 100 psf





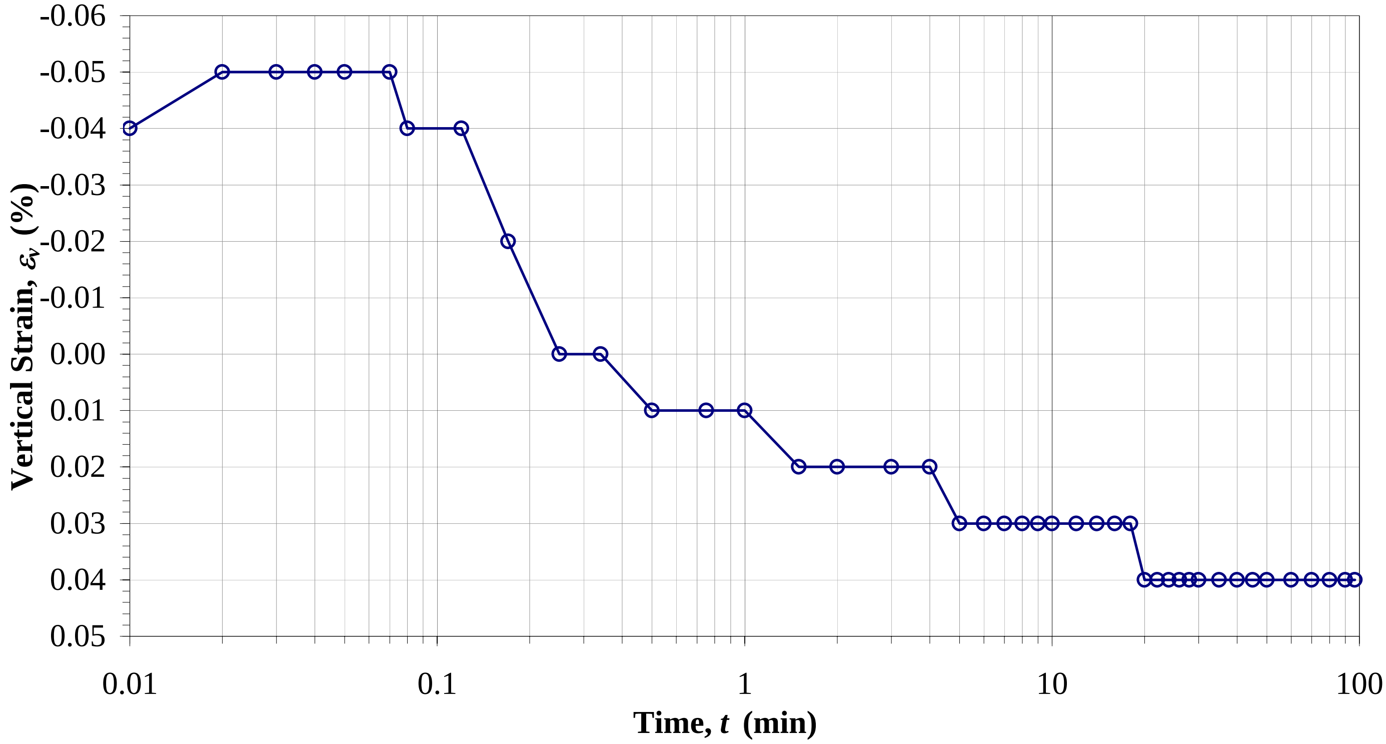
One-Dimensional Consolidation Properties of Soils

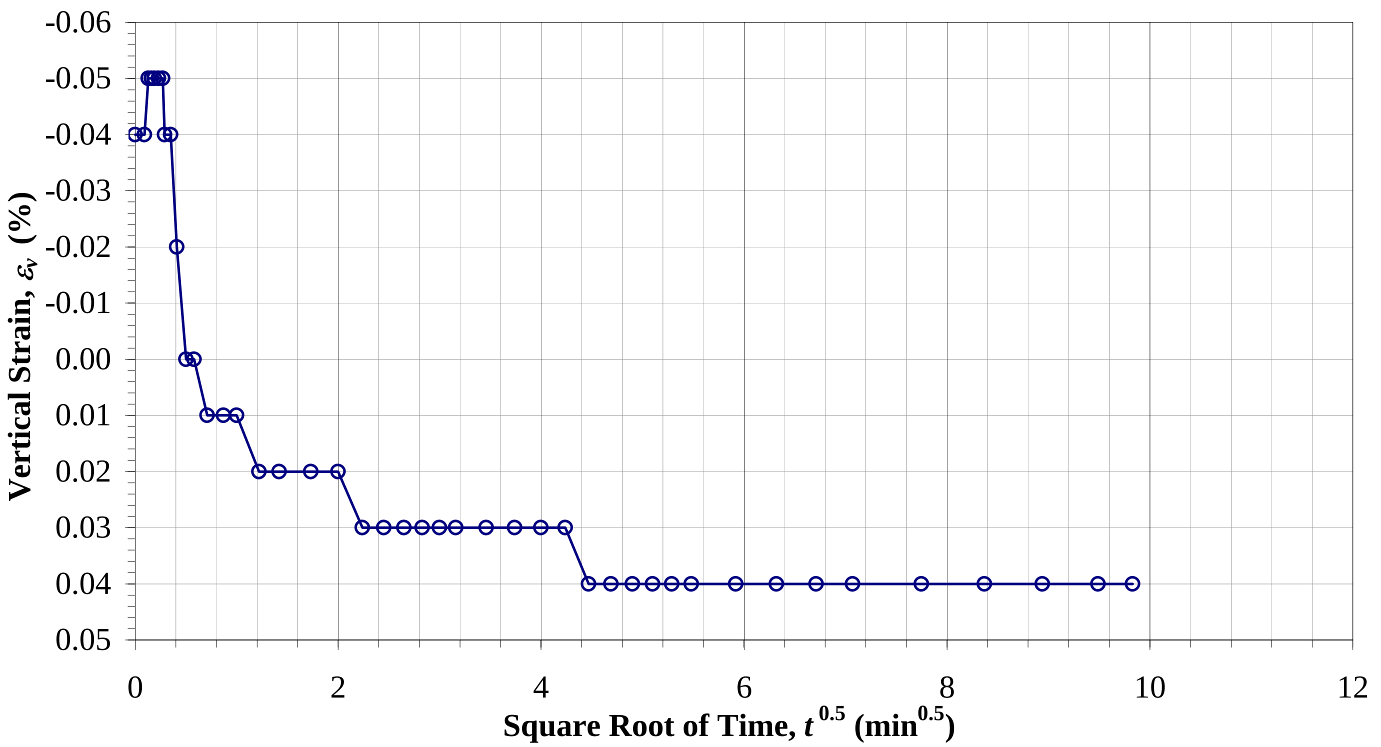
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 14.5'

Constant Load Step: 2 of 14
Stress: 200 psf





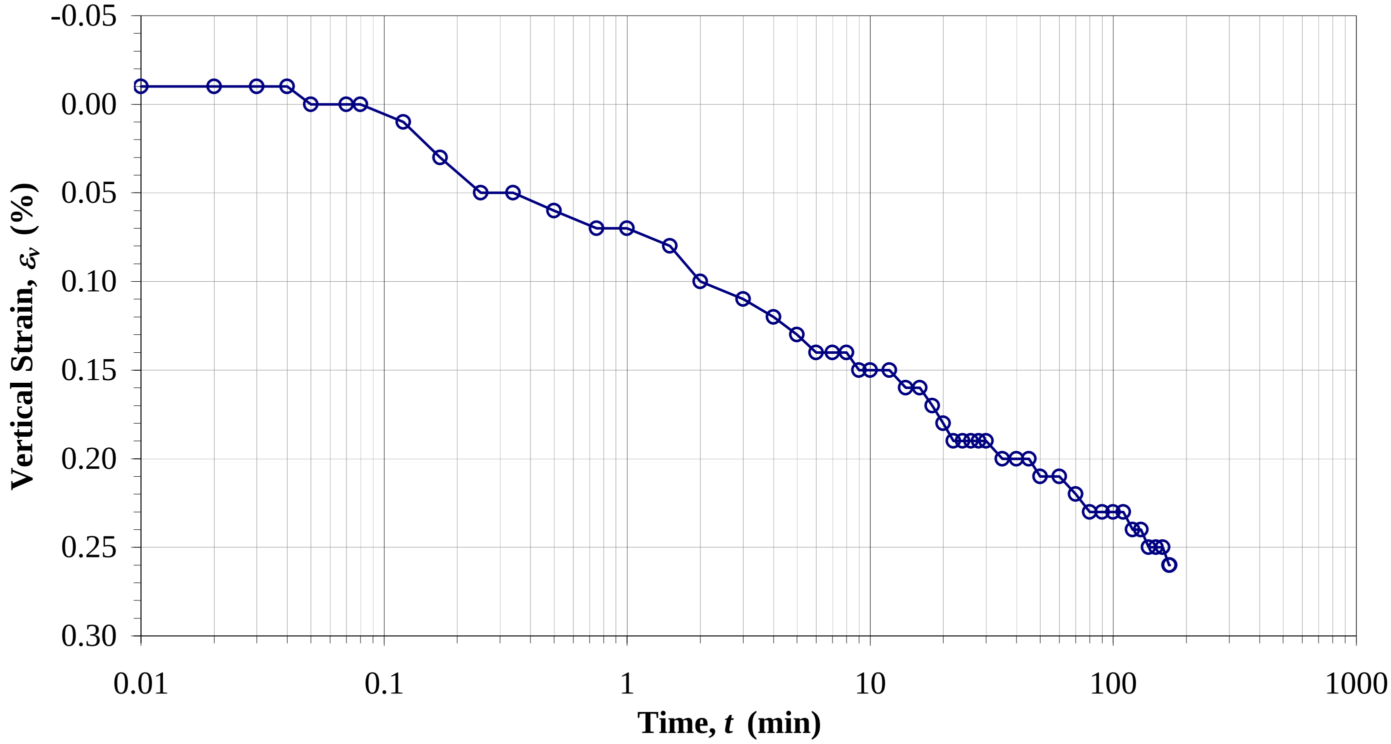
One-Dimensional Consolidation Properties of Soils

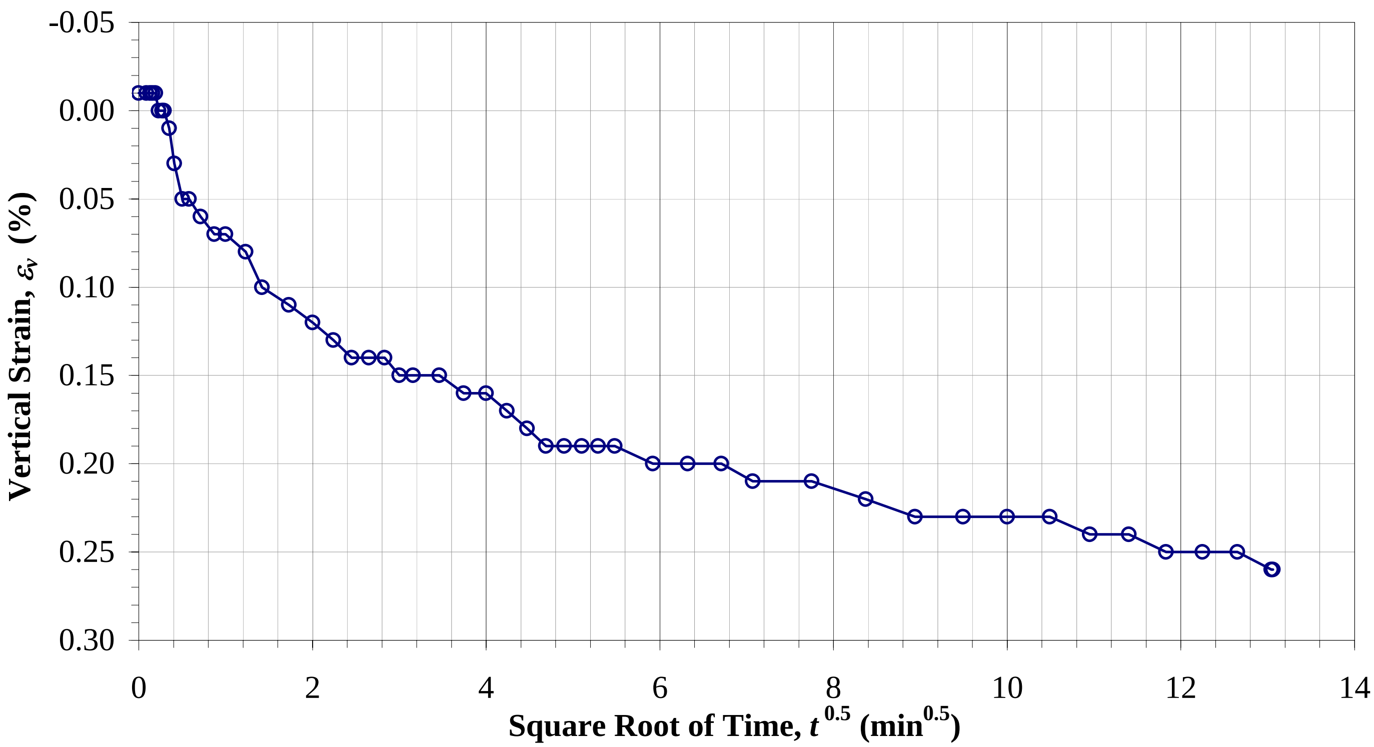
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 14.5'

Constant Load Step: 3 of 14
Stress: 400 psf





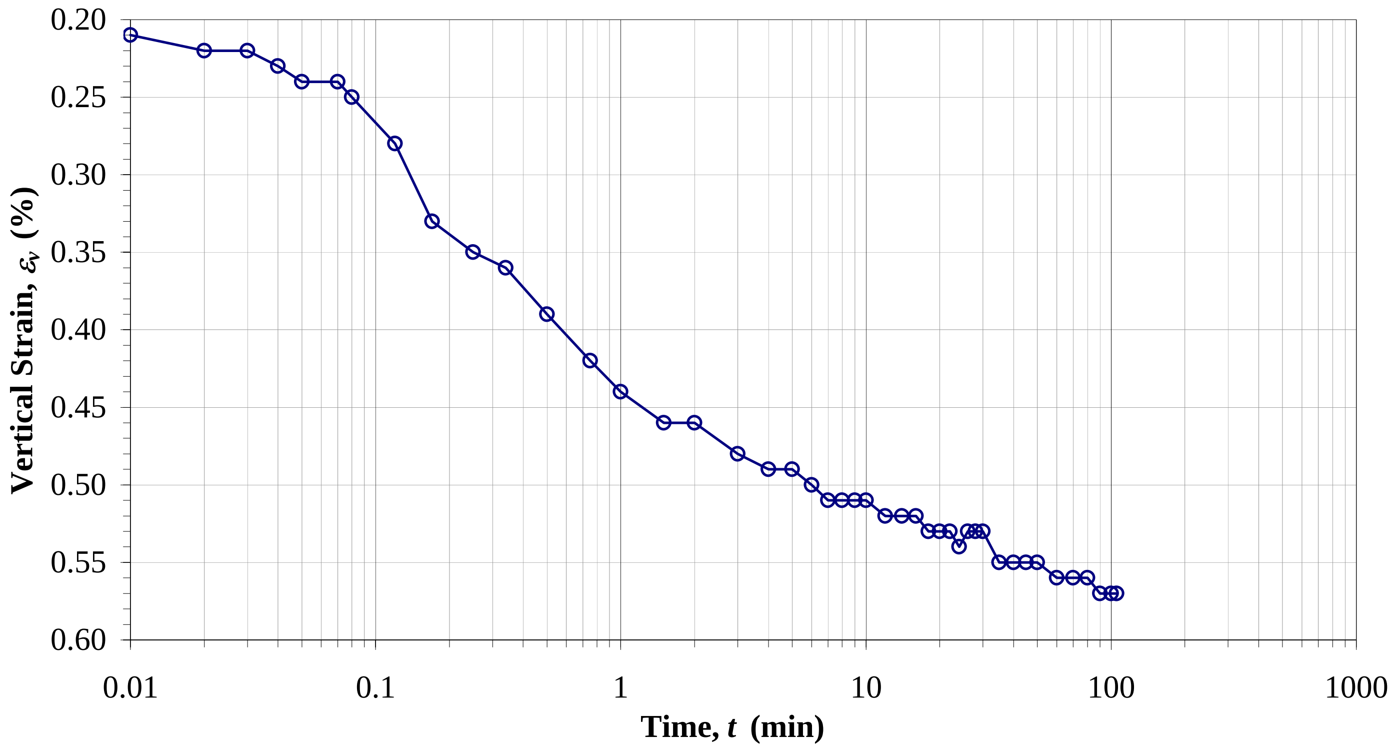
One-Dimensional Consolidation Properties of Soils

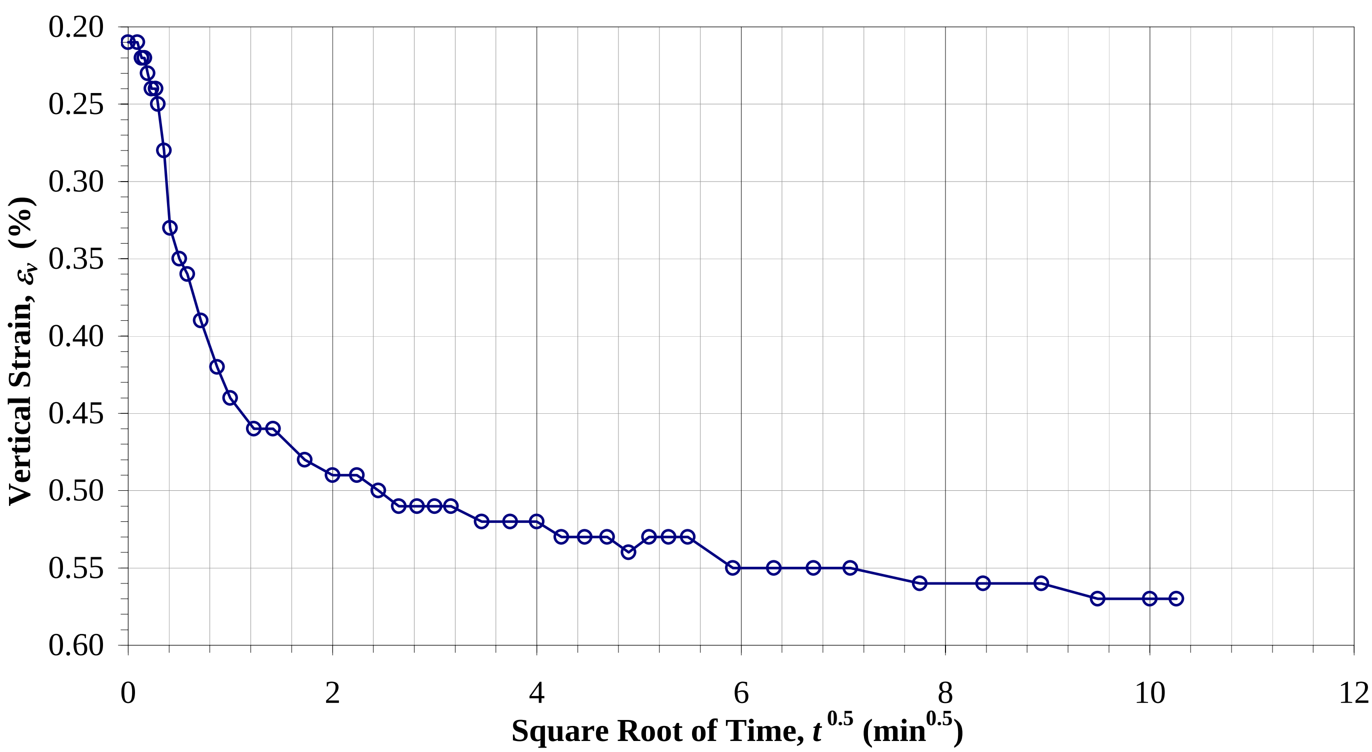
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 14.5'

Constant Load Step: 4 of 14
Stress: 800 psf

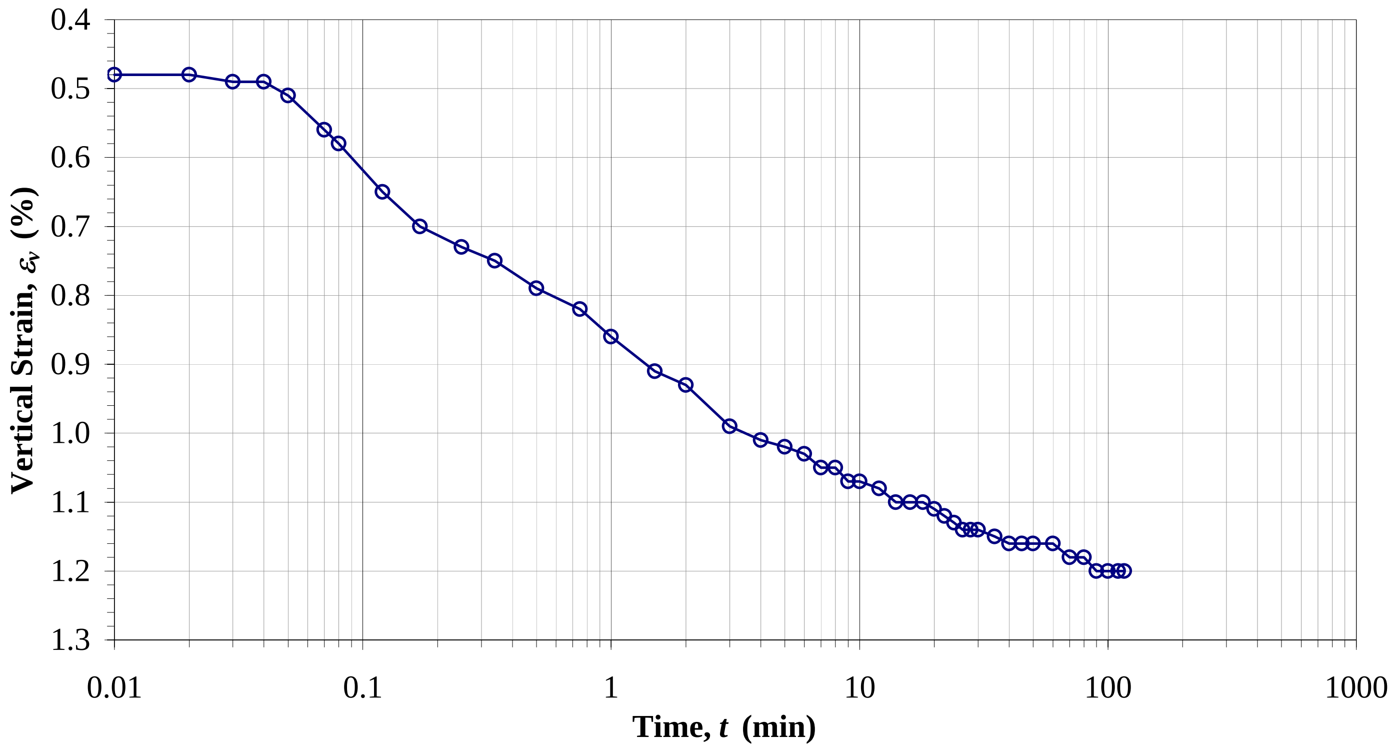


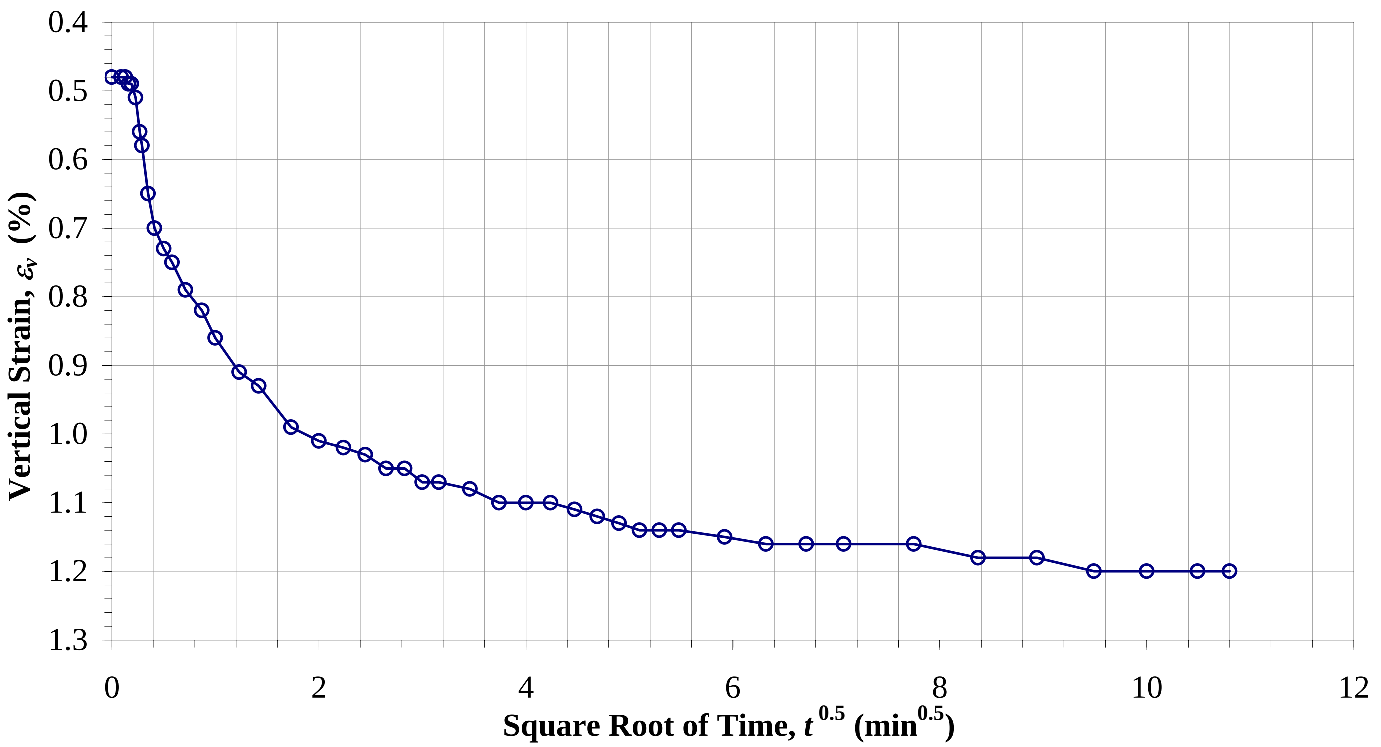


<u>One-Dimensional Consolidation Properties of Soils</u>
(ASTM D2435)

Project: Logan WWTP | **Boring No.:** B-09
No: 00823-012 | **Sample:**
Location: Logan, Utah | **Depth:** 14.5'

Constant Load Step: 5 of 14
Stress: 1600 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP

No: 00823-012

Location: Logan, Utah

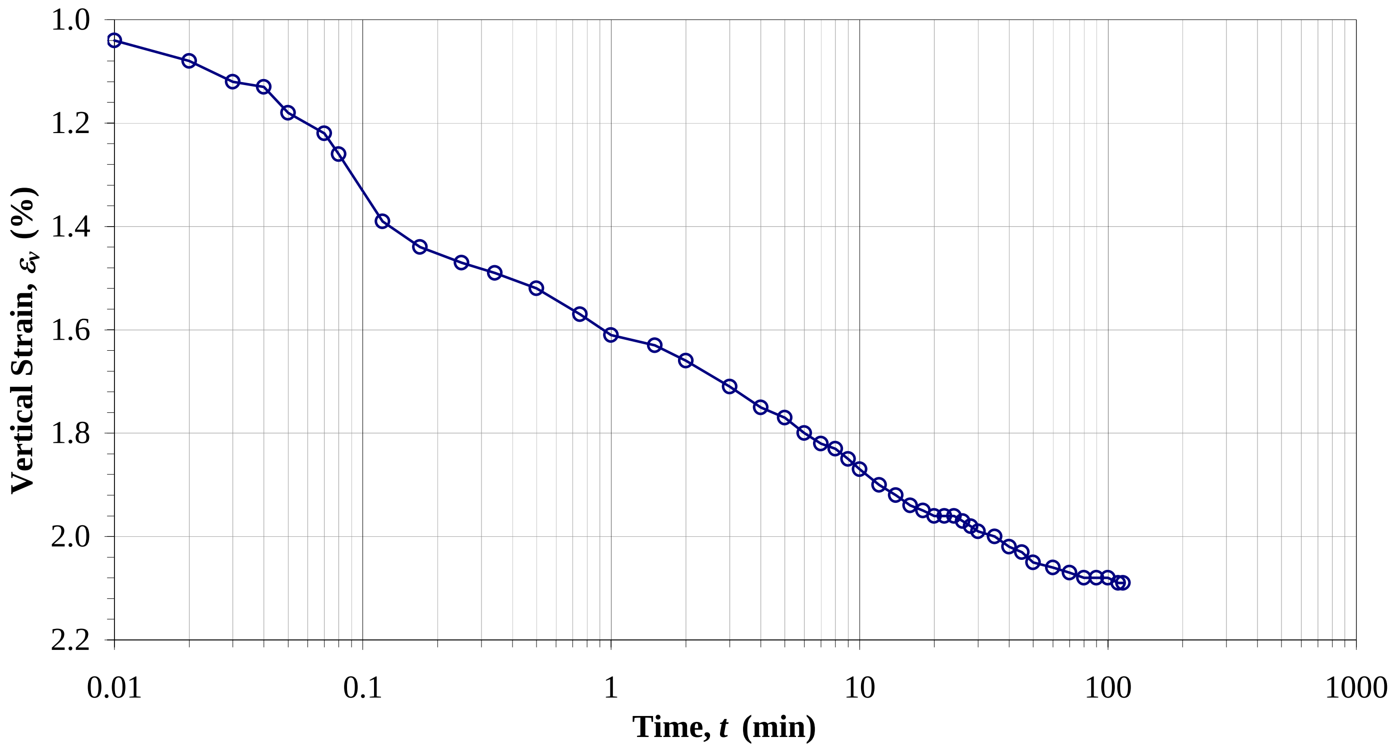
Boring No.: B-09

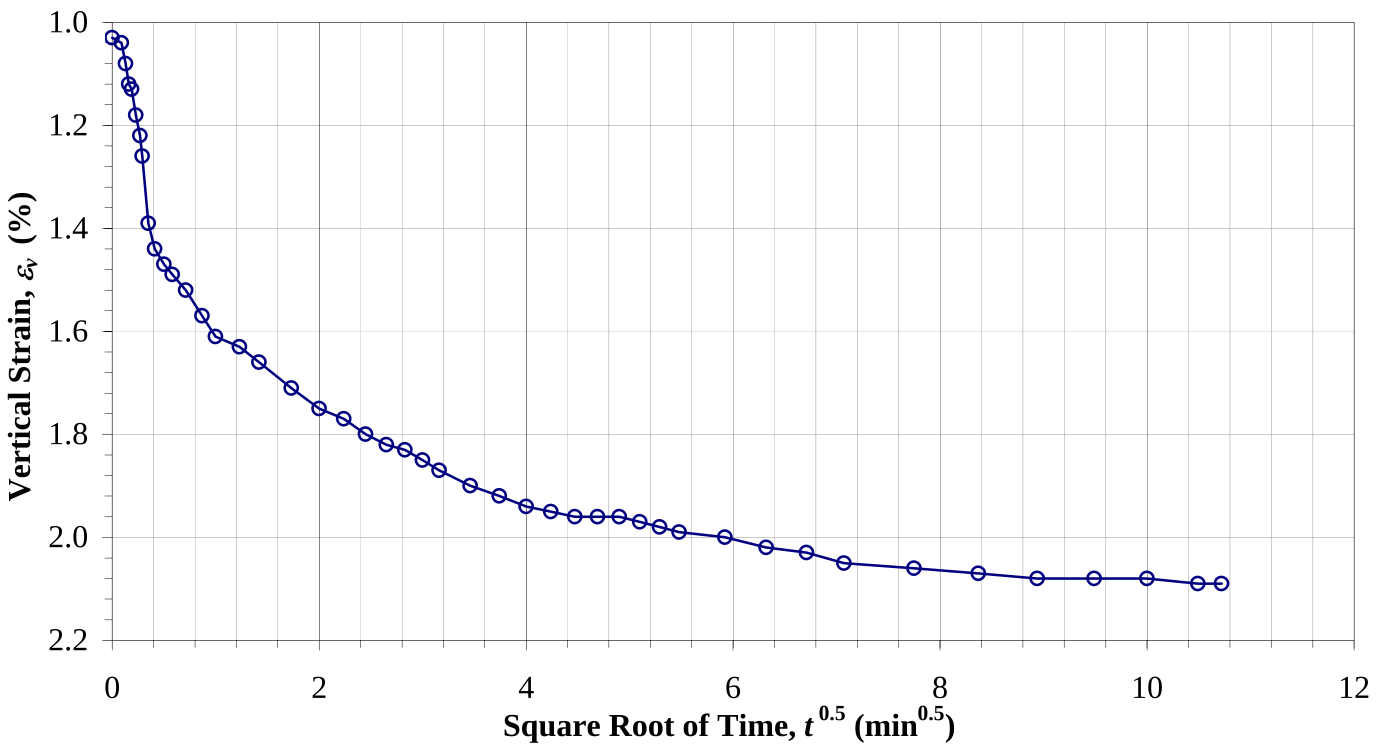
Sample:

Depth: 14.5'

Constant Load Step: 6 of 14

Stress: 3200 psf



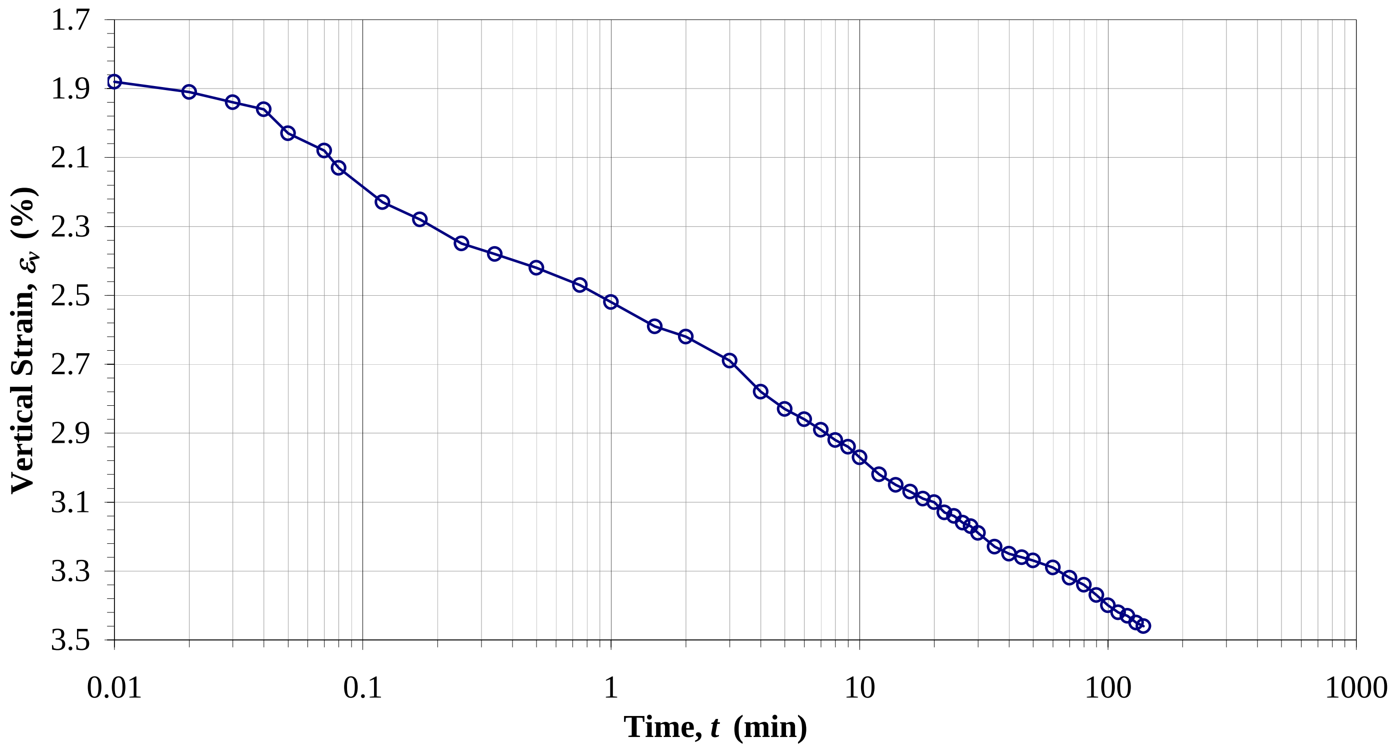


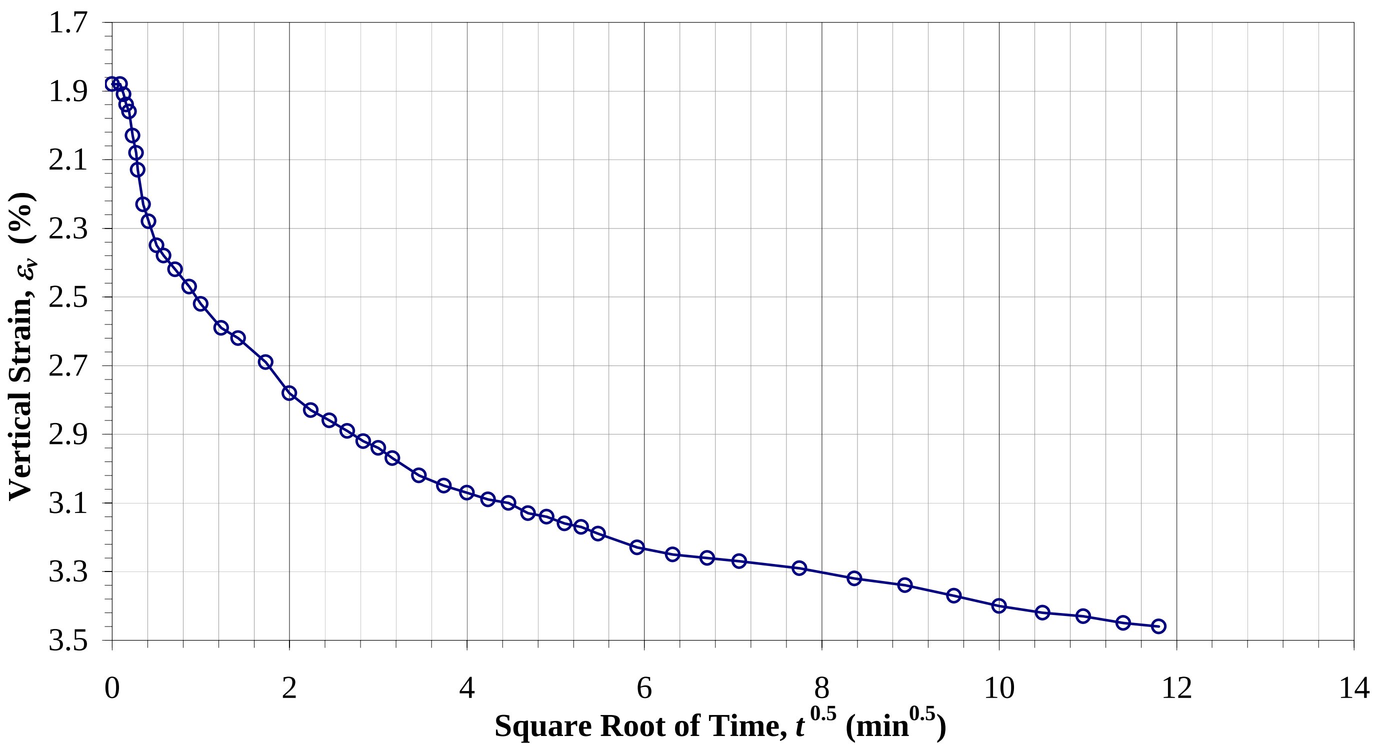
<u>**One-Dimensional Consolidation Properties of Soils**</u>
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 14.5'

Constant Load Step: 7 of 14
Stress: 6400 psf

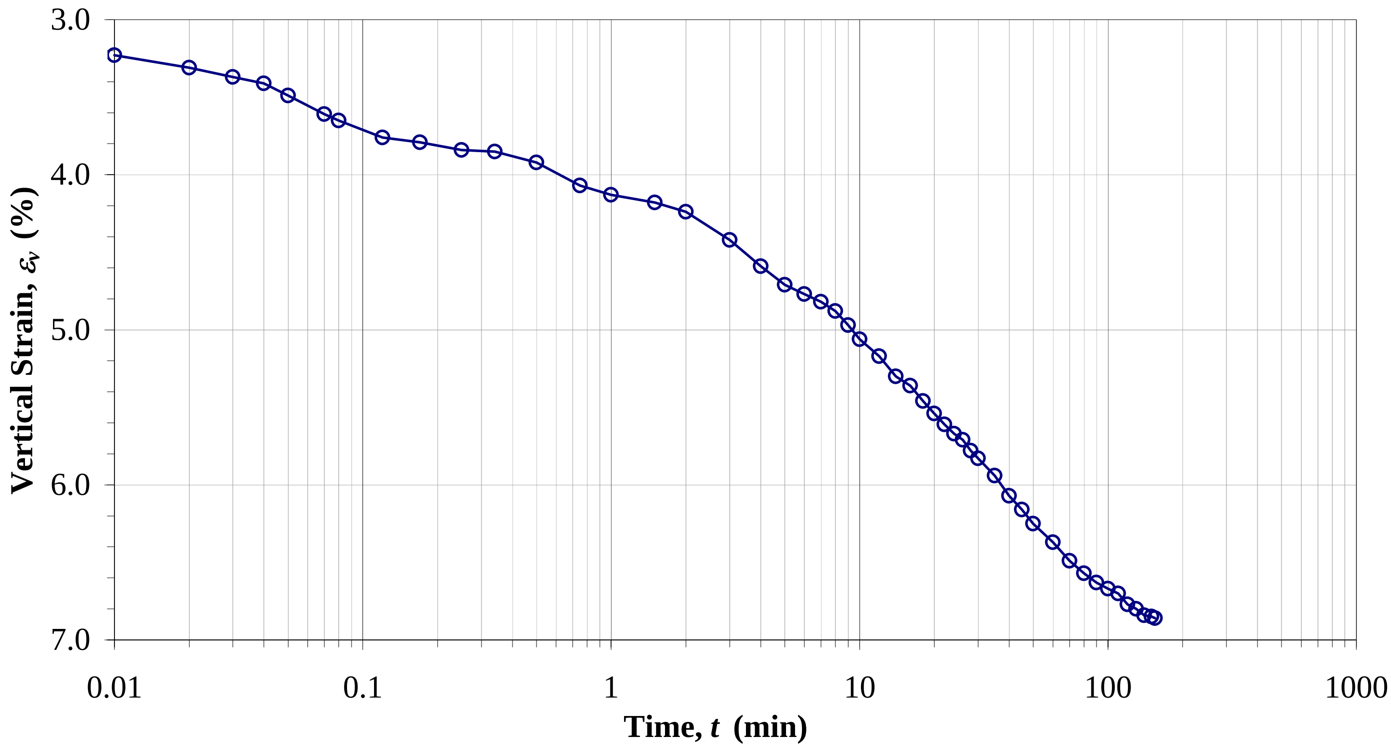


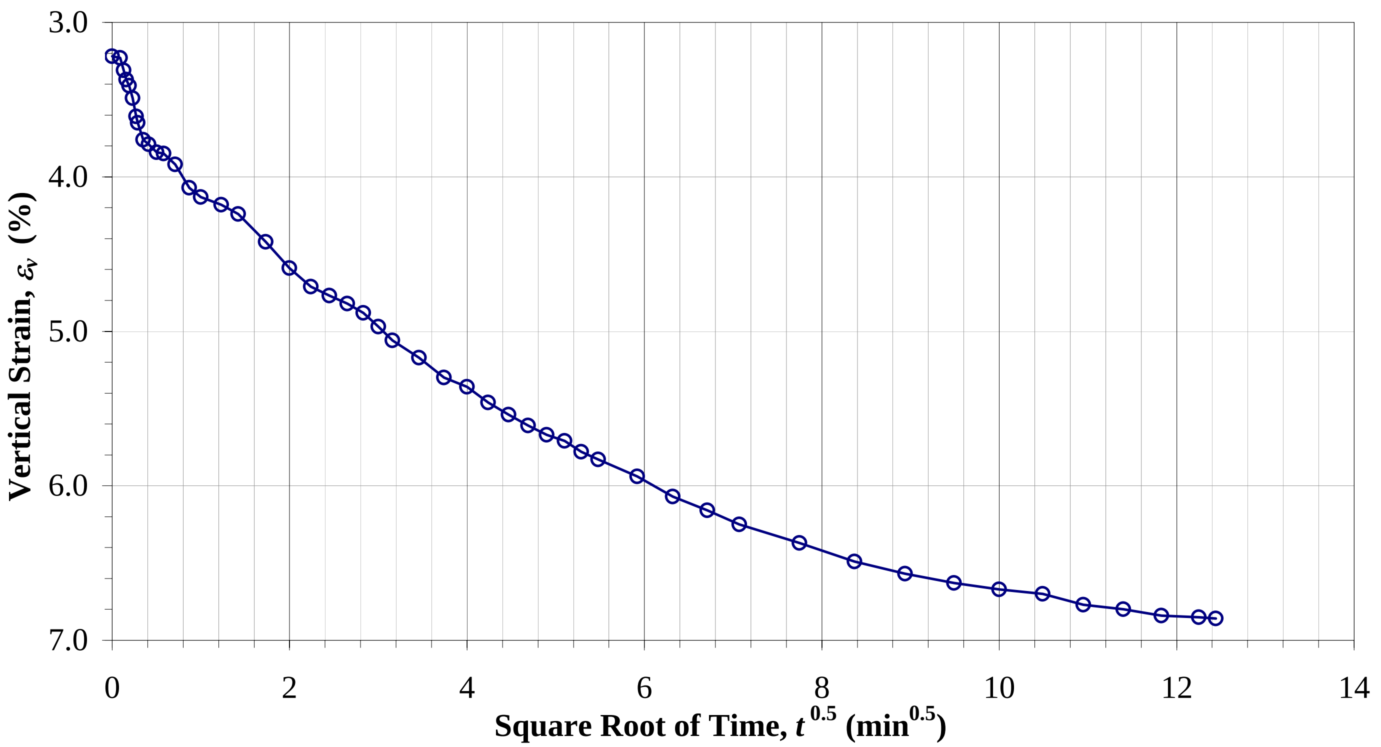


One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Boring No.: B-09
Sample:
Depth: 14.5'

Constant Load Step: 8 of 14
Stress: 12800 psf





One-Dimensional Consolidation Properties of Soils

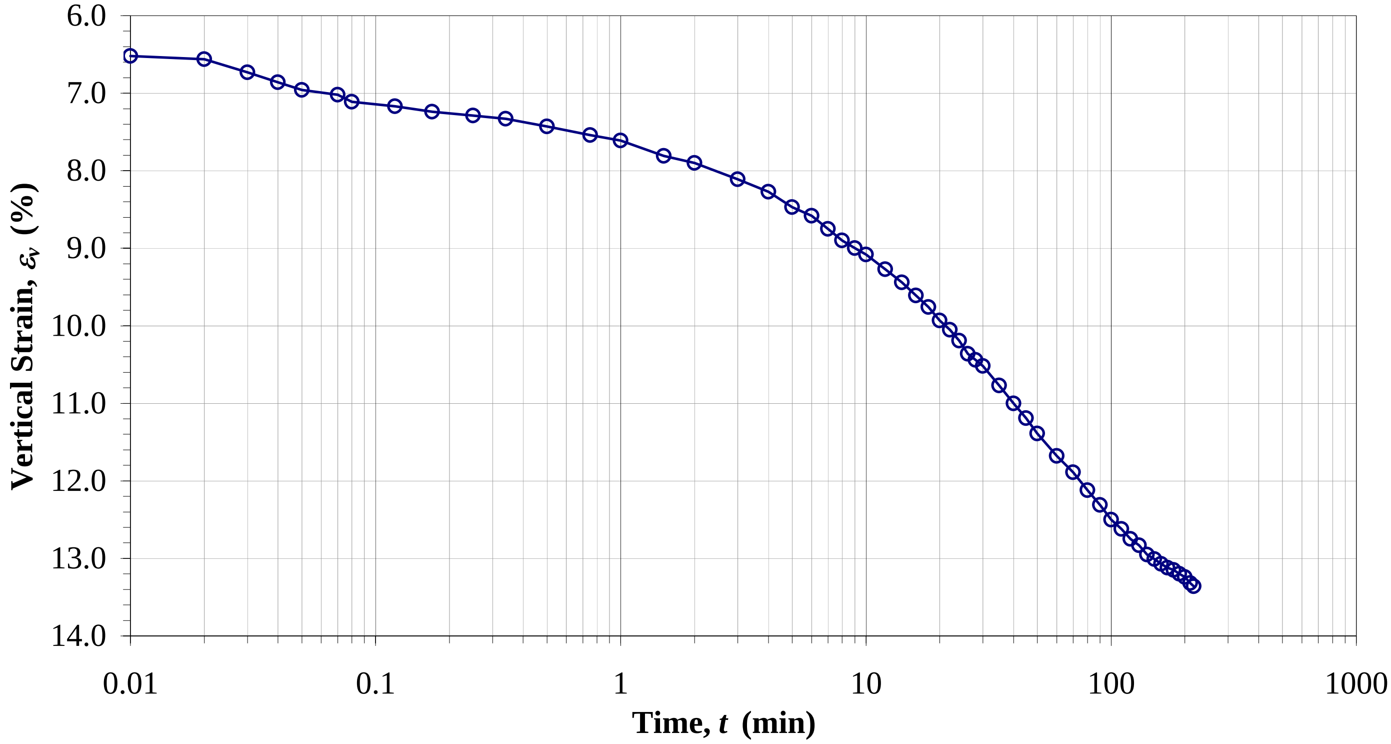
(ASTM D2435)

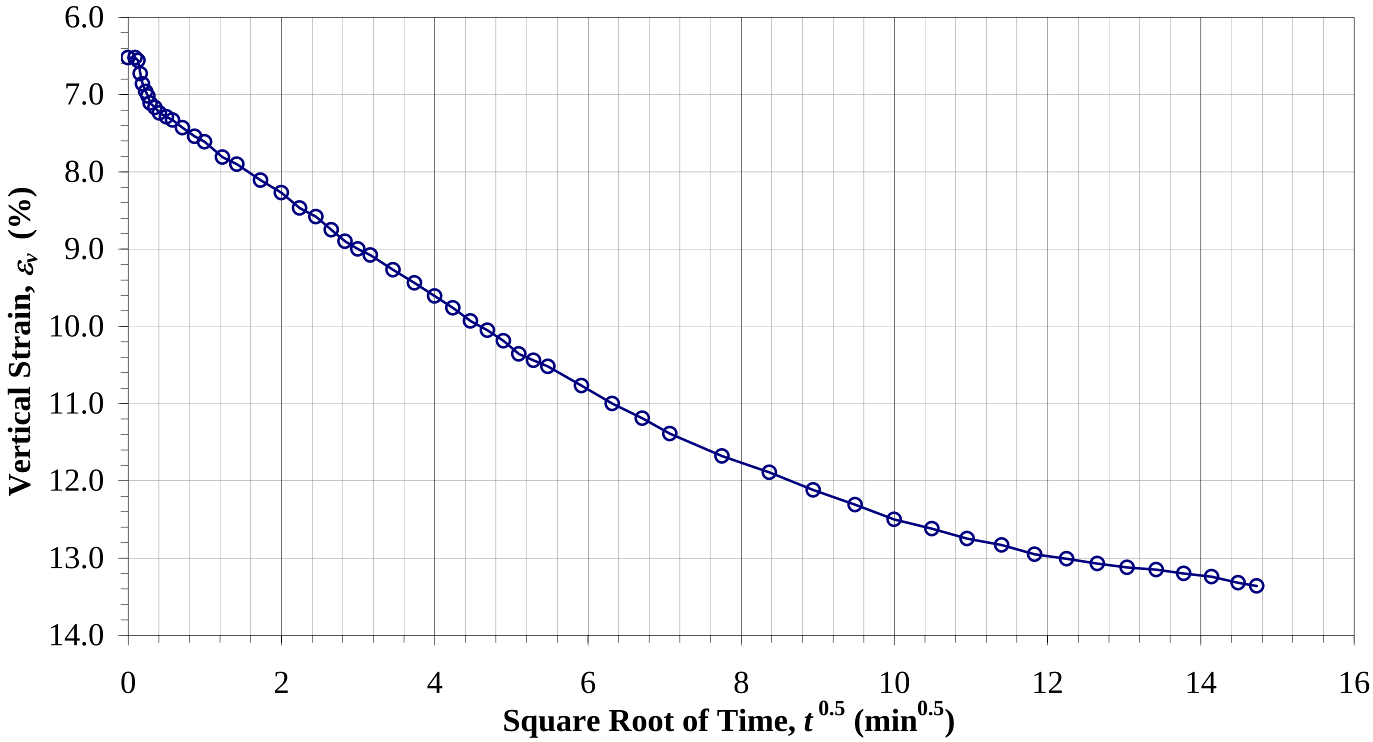
IGES

Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah

Boring No.: **B-09**
Sample:
Depth: **14.5'**

Constant Load Step: 9 of 14
Stress: 25600 psf



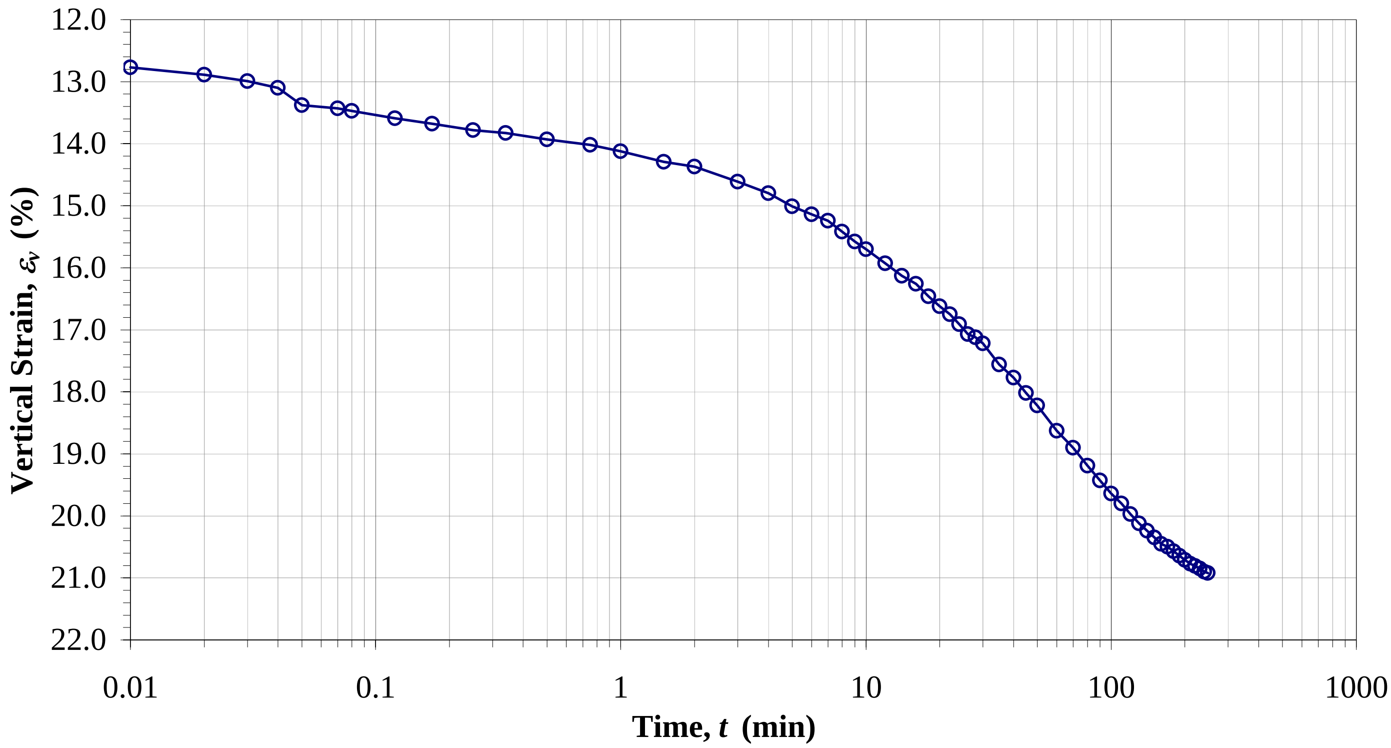


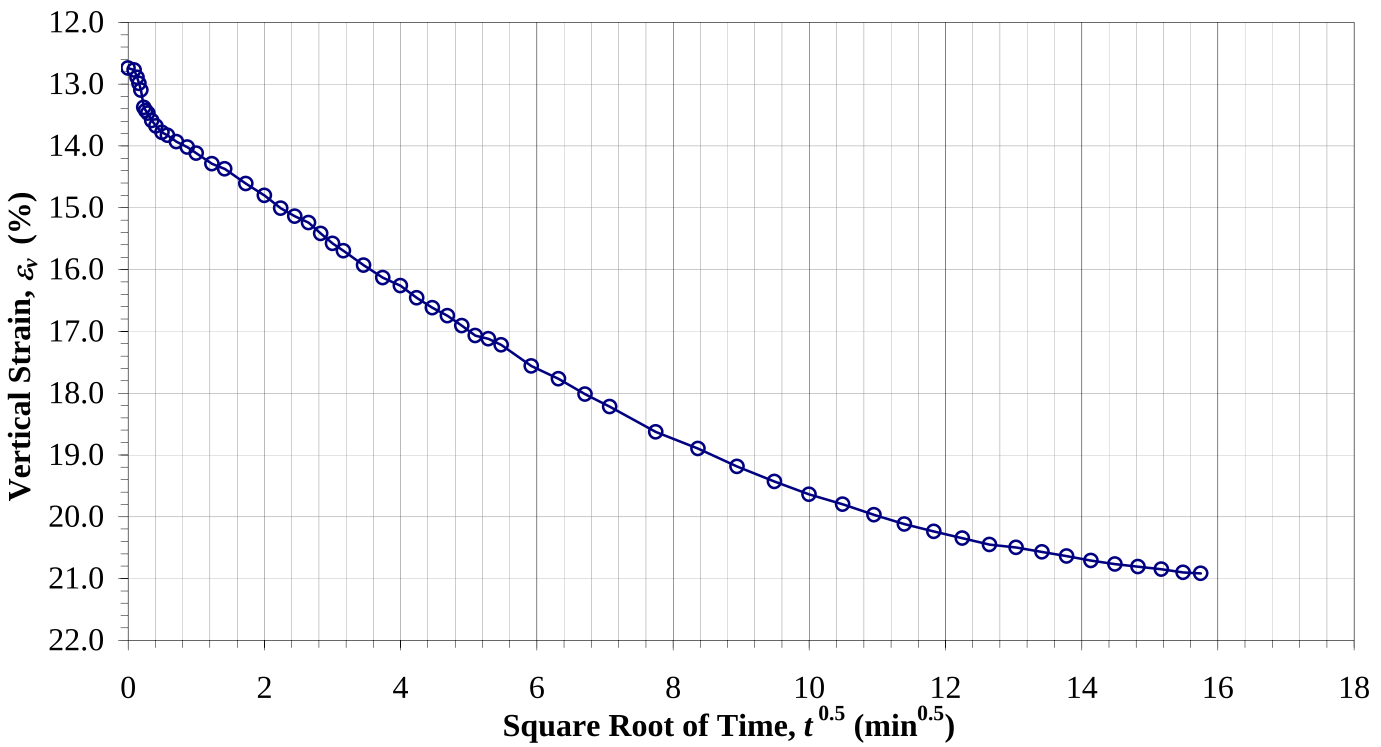
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 14.5'

Constant Load Step: 10 of 14
Stress: 51200 psf





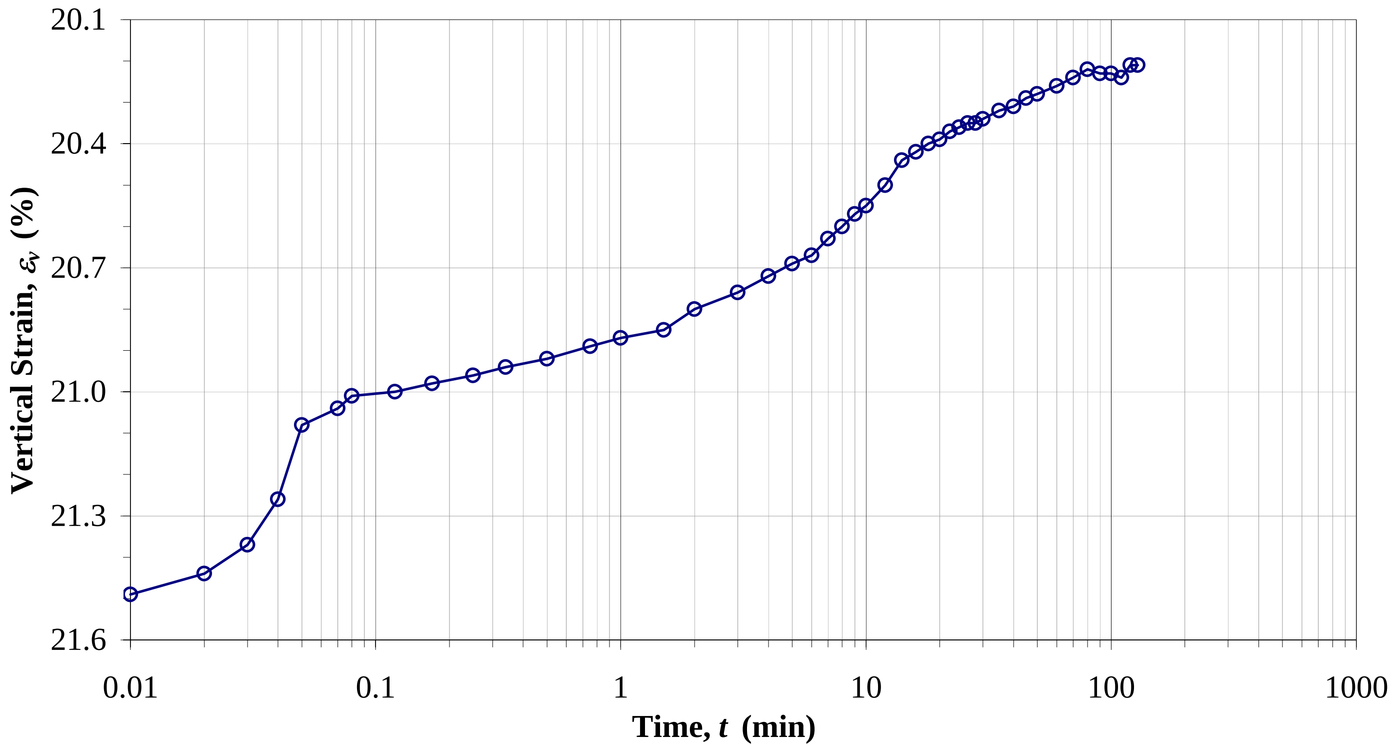
One-Dimensional Consolidation Properties of Soils

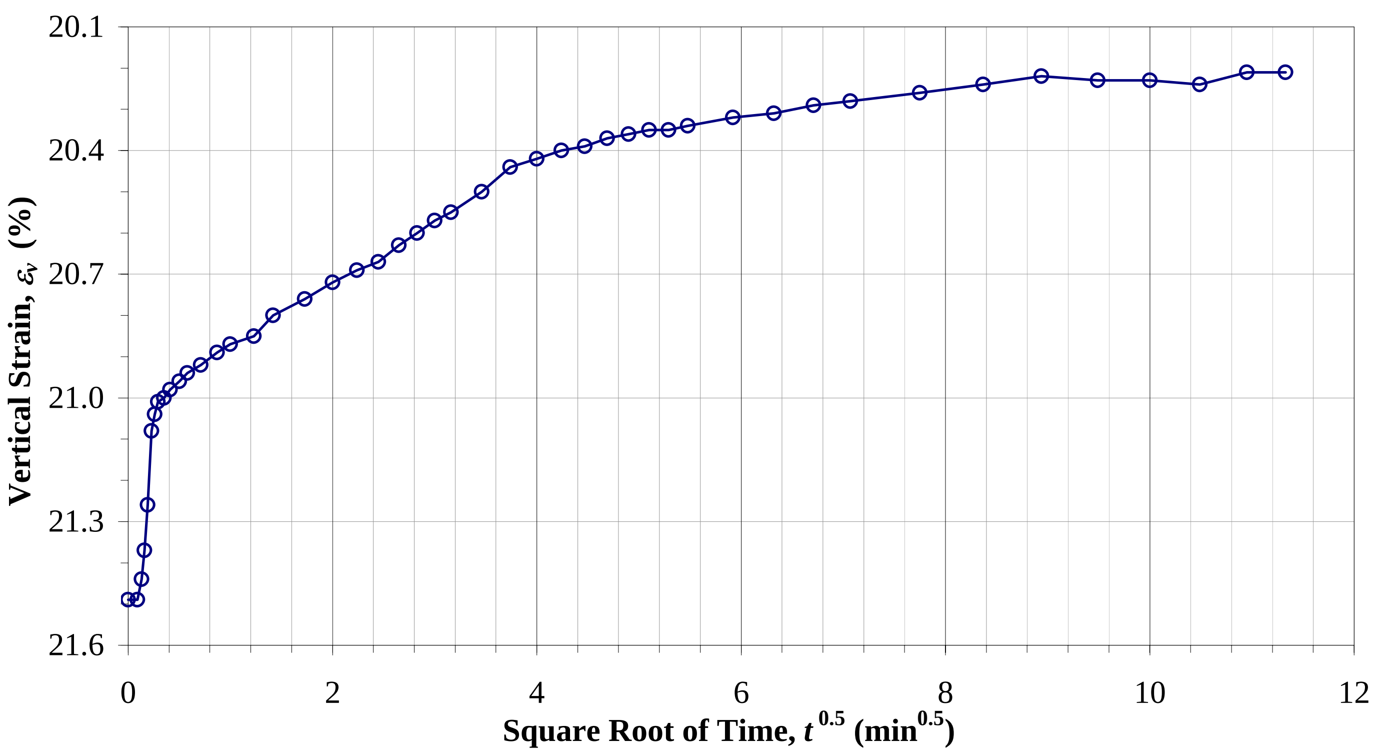
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 14.5'

Constant Load Step: 11 of 14
Stress: 25600 psf





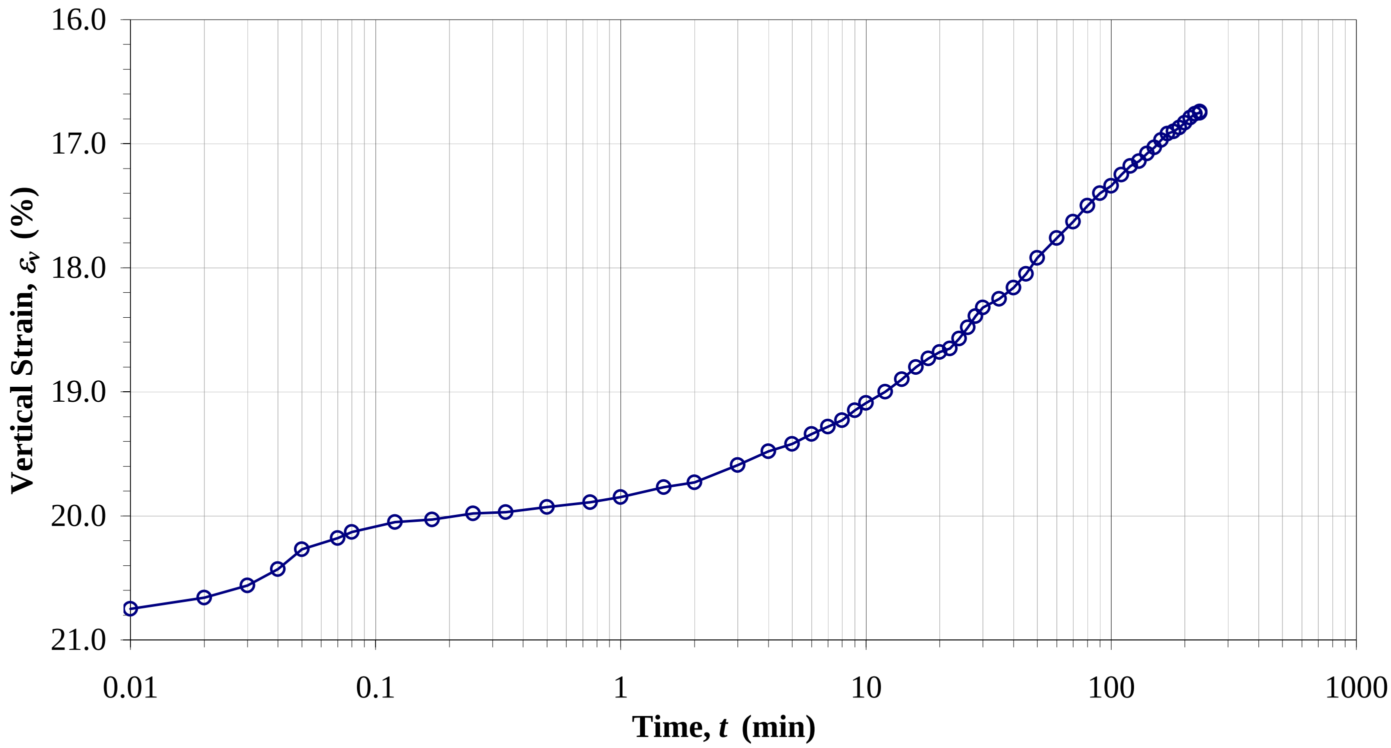
One-Dimensional Consolidation Properties of Soils

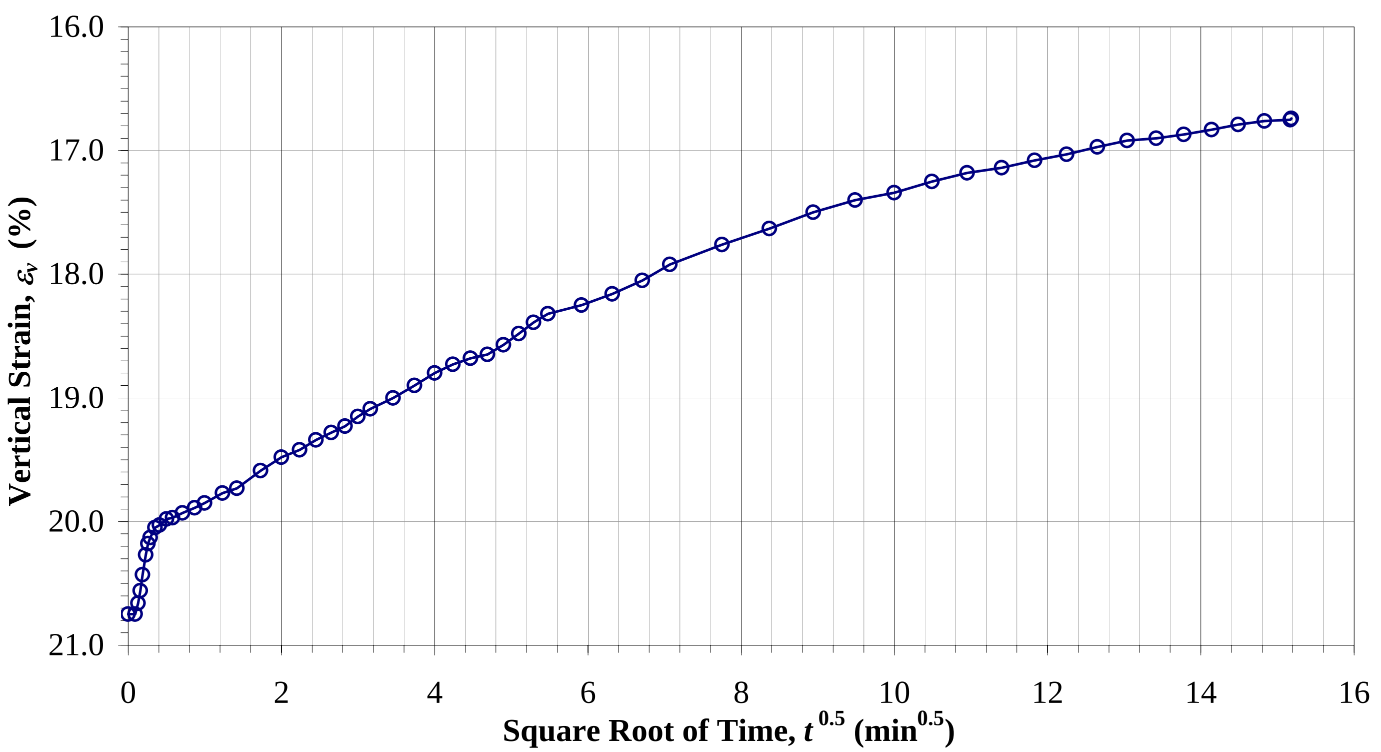
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 14.5'

Constant Load Step: 12 of 14
Stress: 6400 psf





One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

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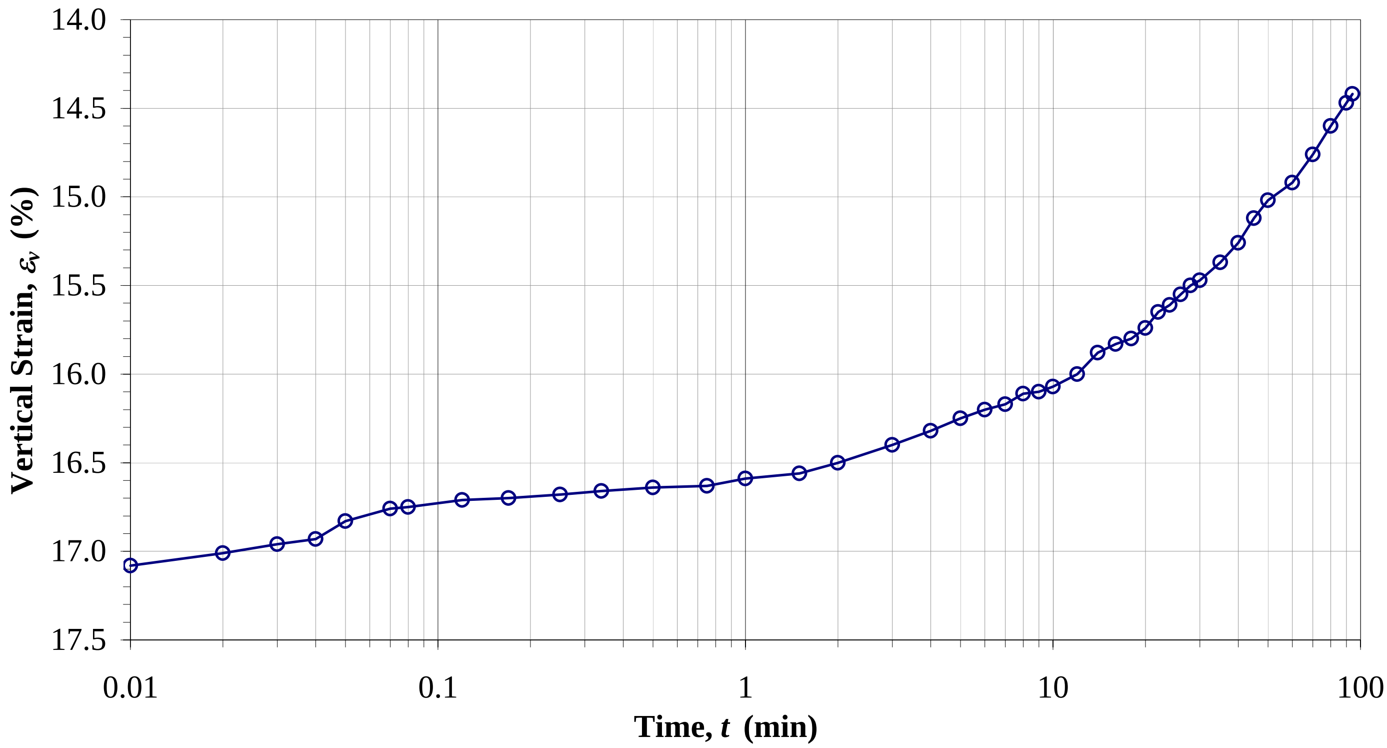
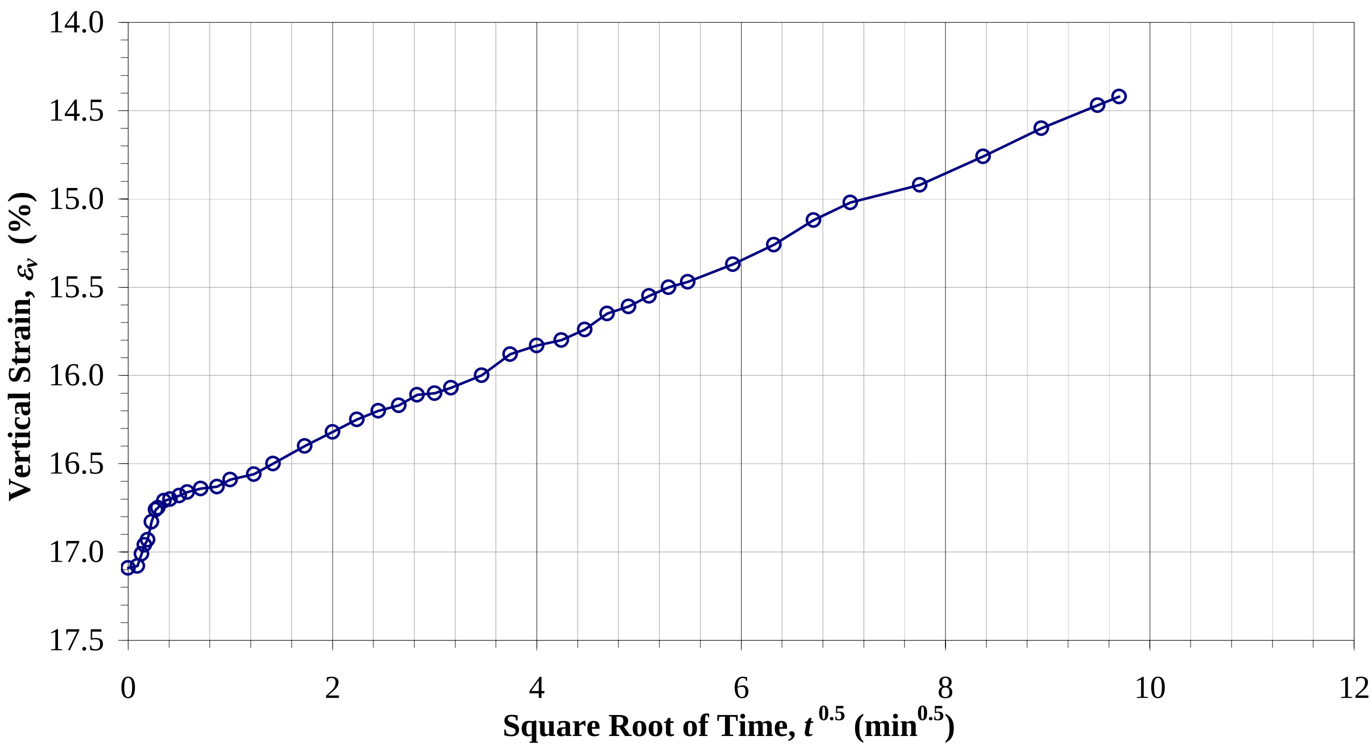
Project: **Logan WWTP** **Boring No.:** **B-09**
No: **00823-012** **Sample:**
Location: Logan, Utah **Depth:** **14.5'**

Constant Load Step: 13 of 14
Stress: 1600 psf



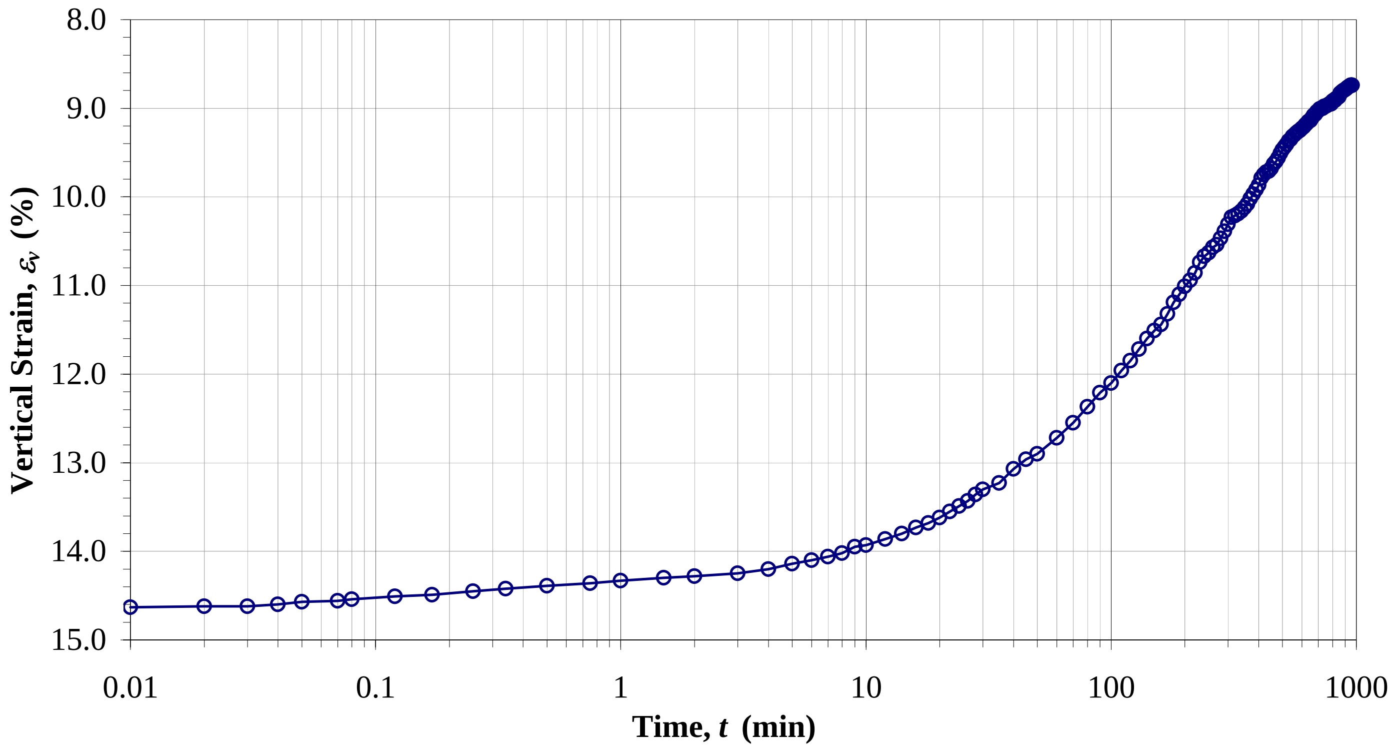


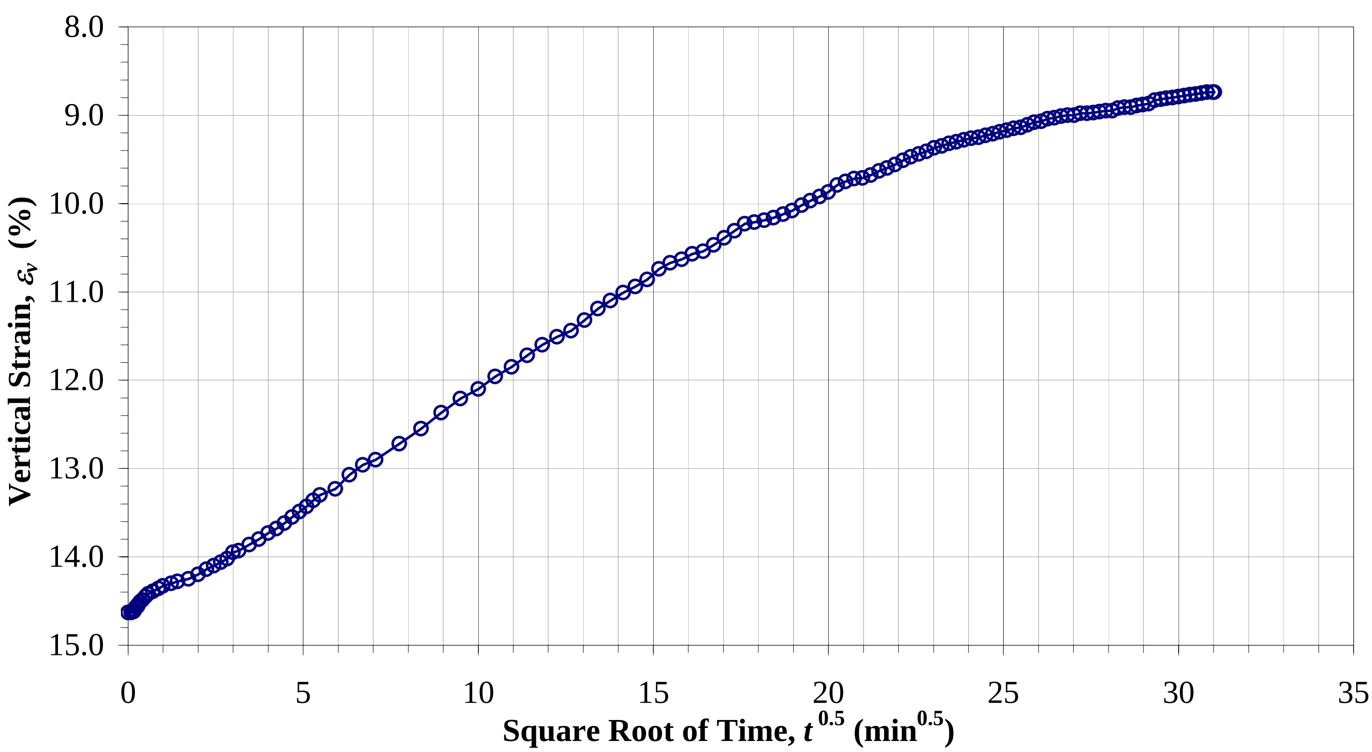
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 14.5'

Constant Load Step: 14 of 14
Stress: 400 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/21/2013
By: JDF

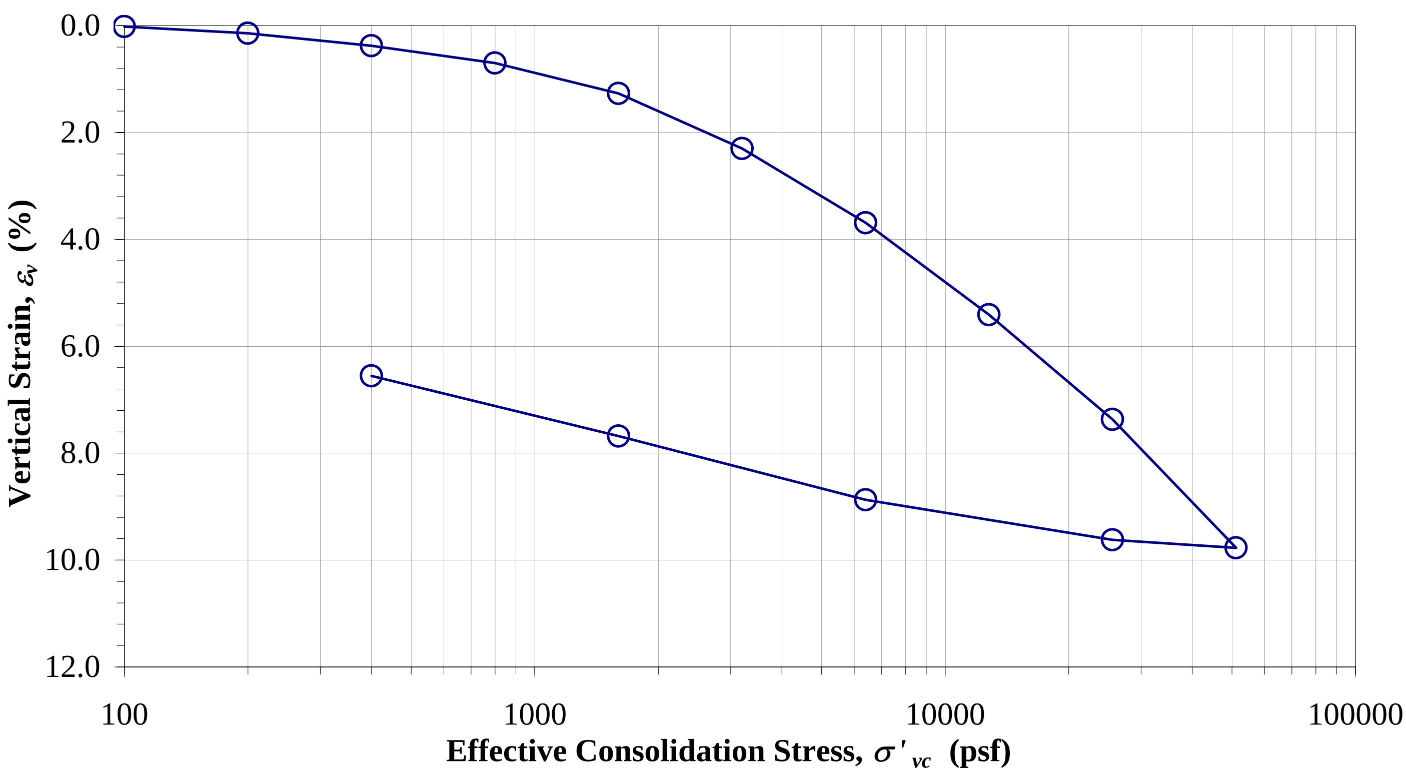
Boring No.: B-09
Sample:
Depth: 39.5'
Sample Description: Grey clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Test method:	A	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9345
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	203.77	201.09
Wt. rings/tare (g)	42.80	42.80
Total unit wt., γ (pcf)	133.8	140.8
Wet soil + tare (g)	286.10	
Dry soil + tare (g)	261.48	
Tare (g)	127.73	
Water content, ω (%)	18.4	16.4
Dry unit wt., γ_d (pcf)	113.0	120.9
Saturation, S	1.00	1.00

*Note: C_v, C_c, C_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0000	0.00	1.0000	0.4755
100	0.0002	0.02	0.9998	0.4752
200	0.0015	0.15	0.9985	0.4733
400	0.0038	0.38	0.9962	0.4699
800	0.0070	0.70	0.9930	0.4651
1600	0.0127	1.27	0.9873	0.4567
3200	0.0230	2.30	0.9770	0.4415
6400	0.0369	3.69	0.9631	0.4210
12800	0.0541	5.41	0.9459	0.3956
25600	0.0737	7.37	0.9263	0.3667
51200	0.0977	9.77	0.9023	0.3313
25600	0.0962	9.62	0.9038	0.3335
6400	0.0887	8.87	0.9113	0.3446
1600	0.0768	7.68	0.9232	0.3622
400	0.0655	6.55	0.9345	0.3788



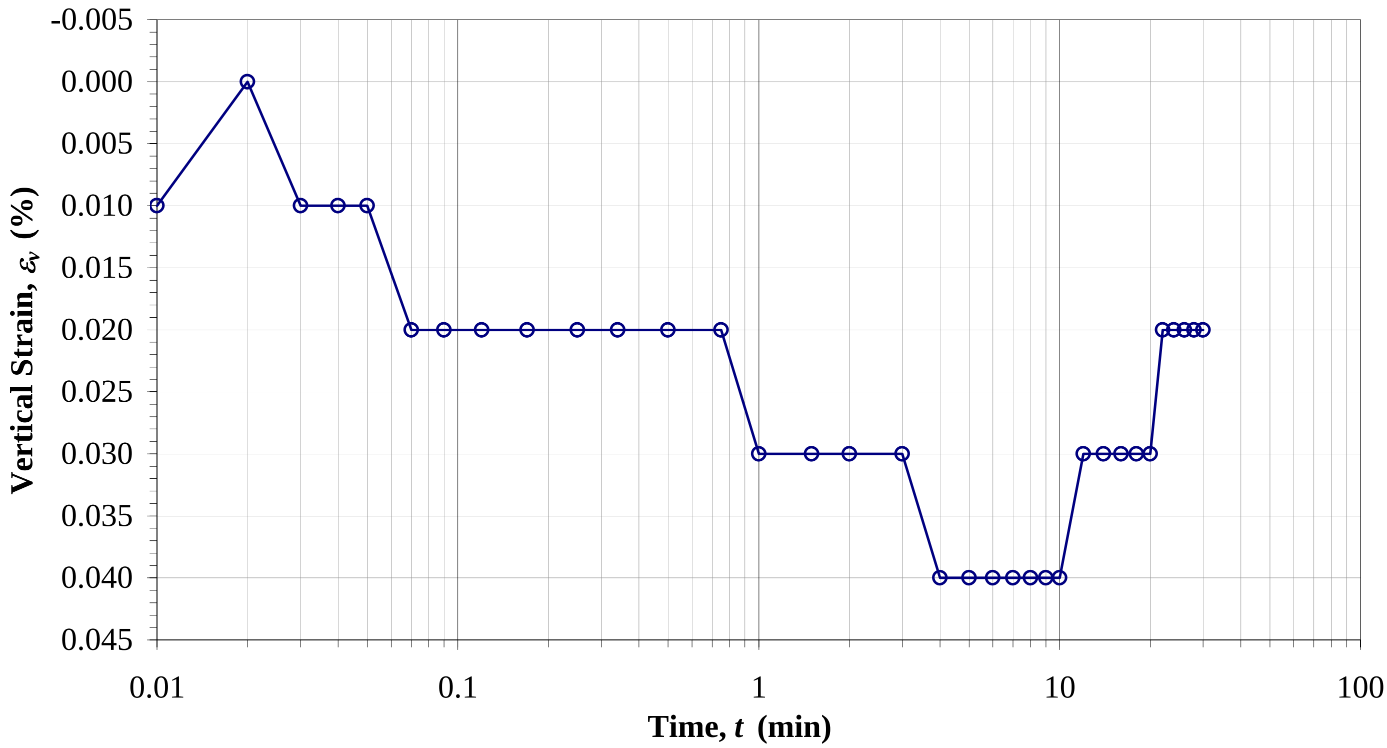
Entered: ________
Reviewed: ________

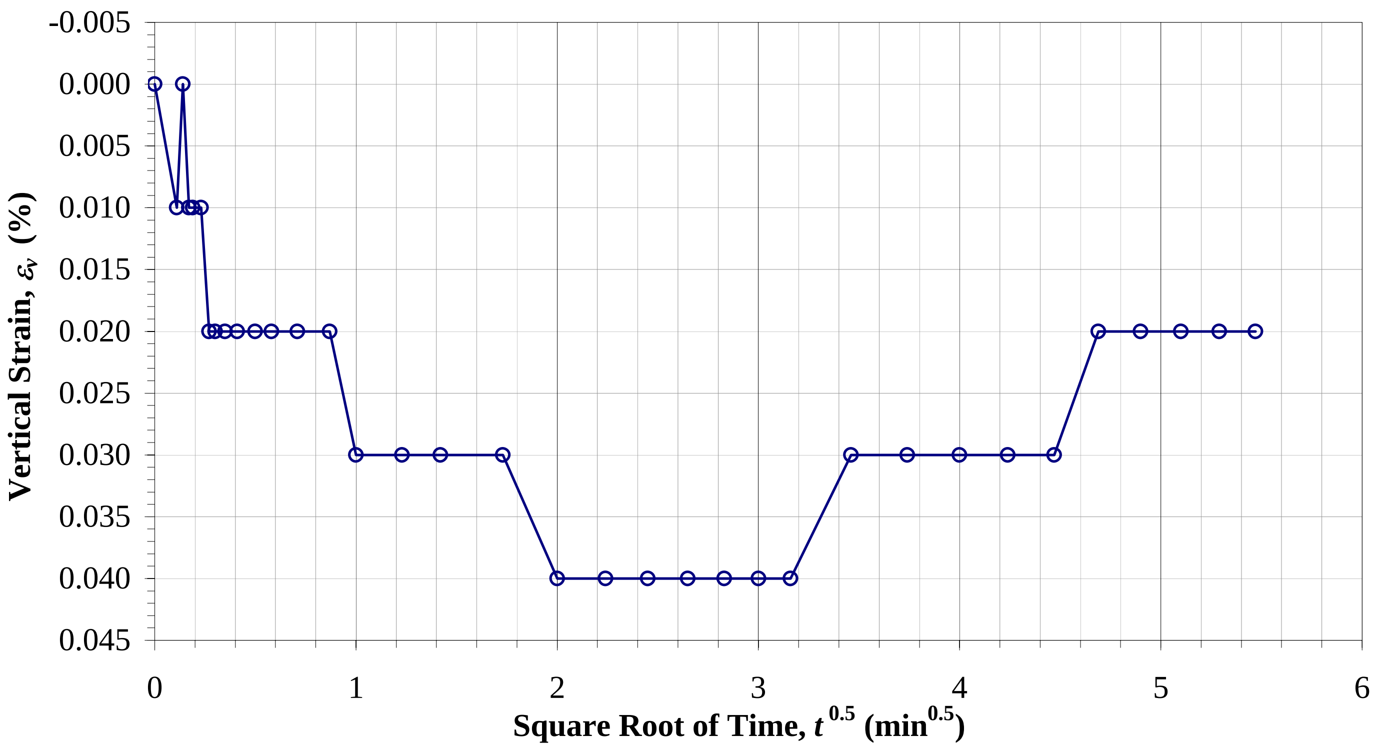
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 39.5'

Constant Load Step: 1 of 14
Stress: 100 psf





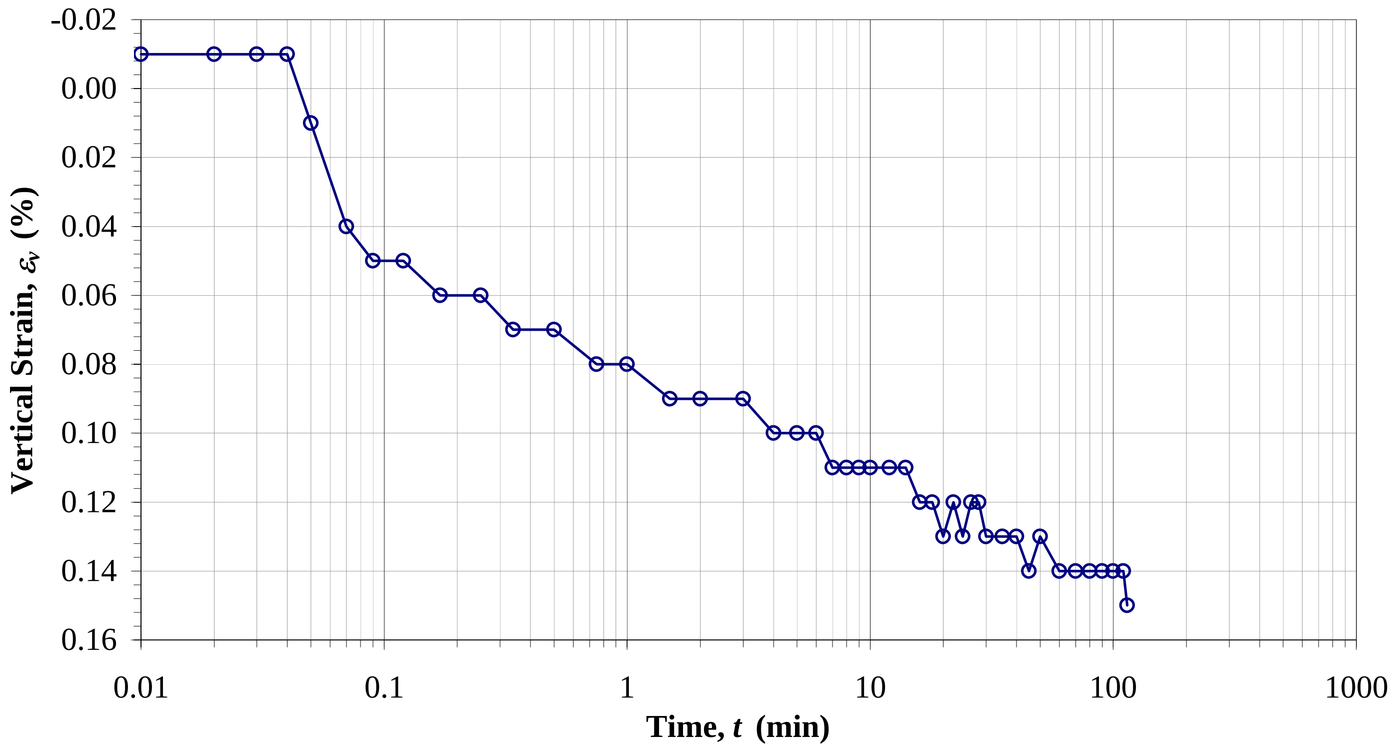
One-Dimensional Consolidation Properties of Soils

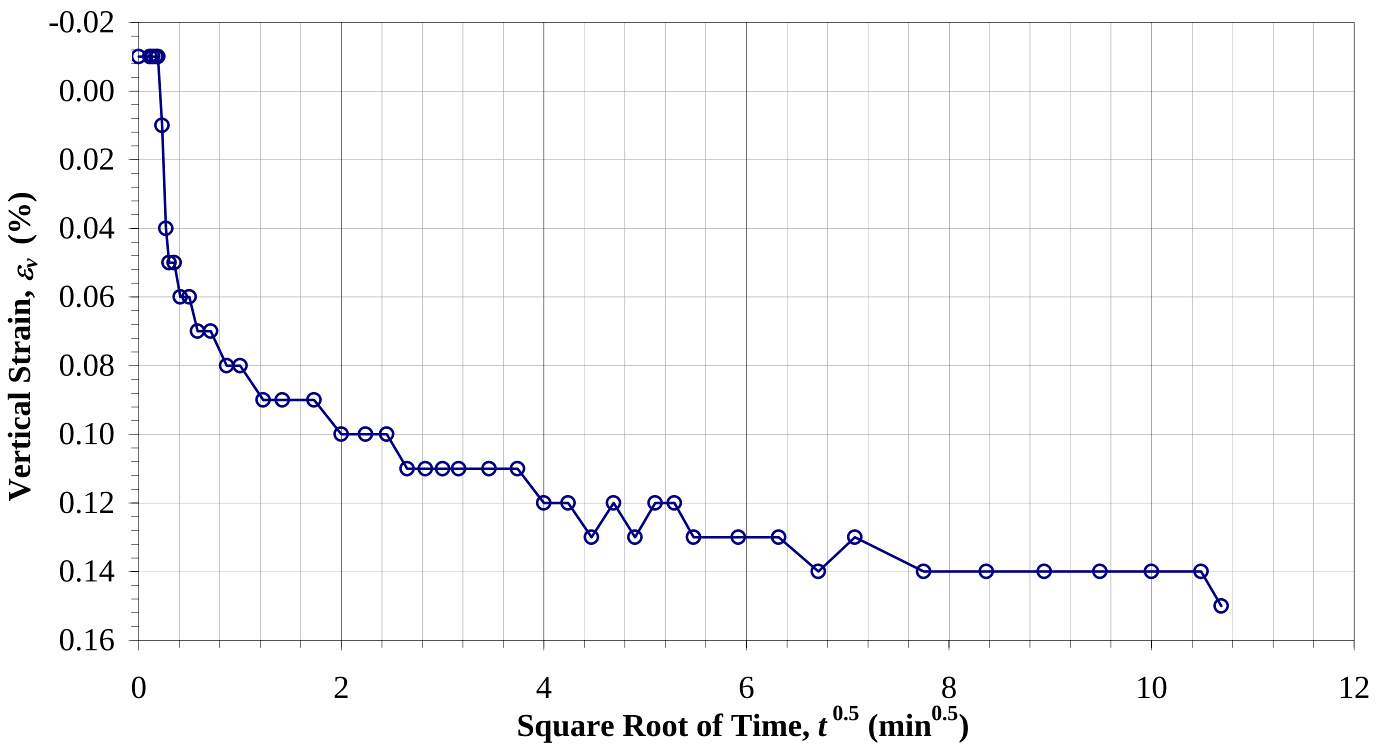
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 39.5'

Constant Load Step: 2 of 14
Stress: 200 psf



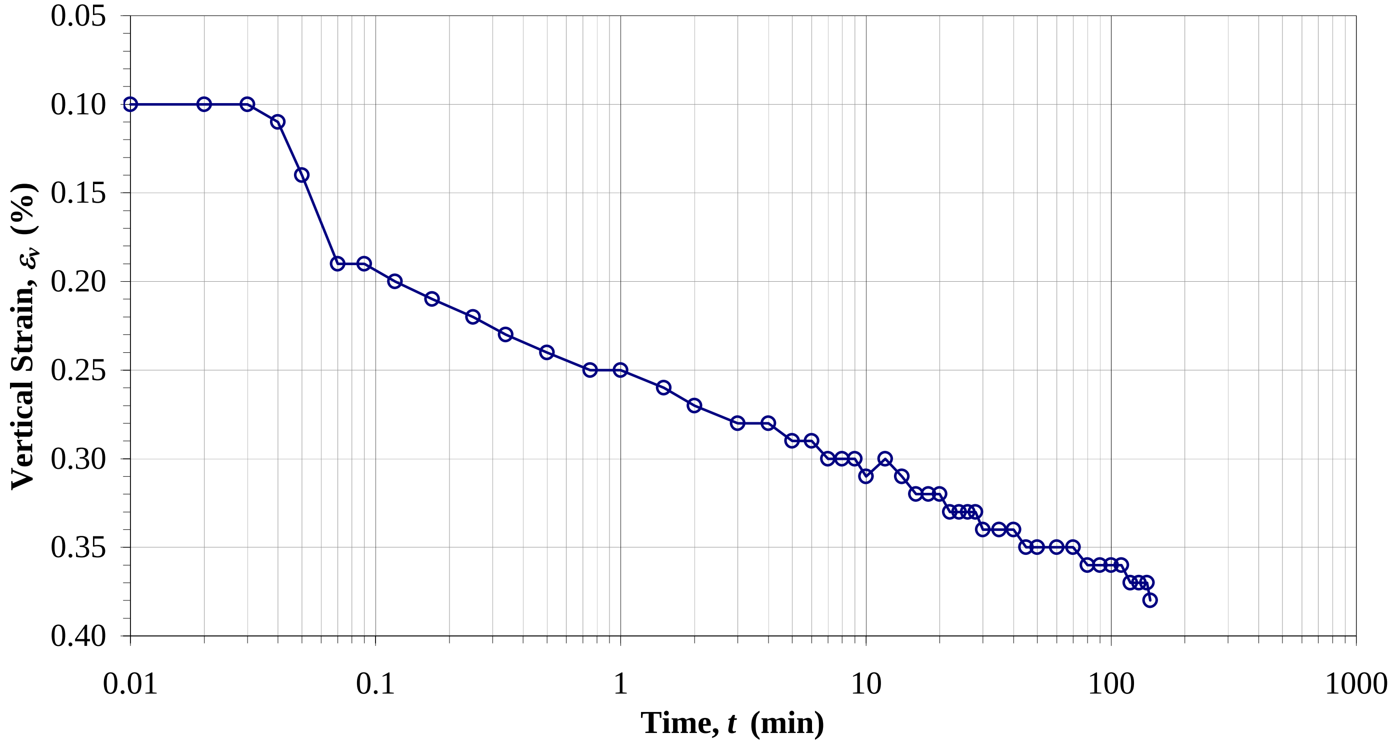


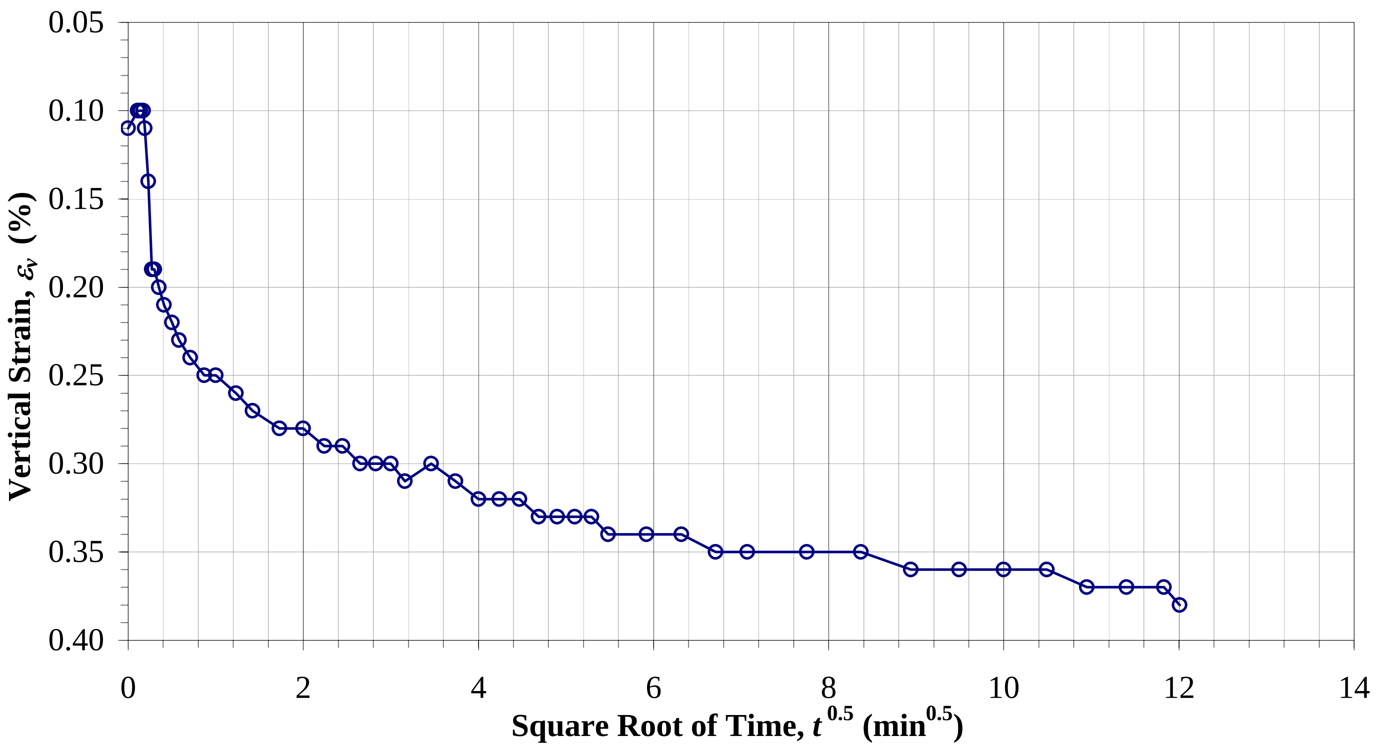
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 39.5'

Constant Load Step: 3 of 14
Stress: 400 psf



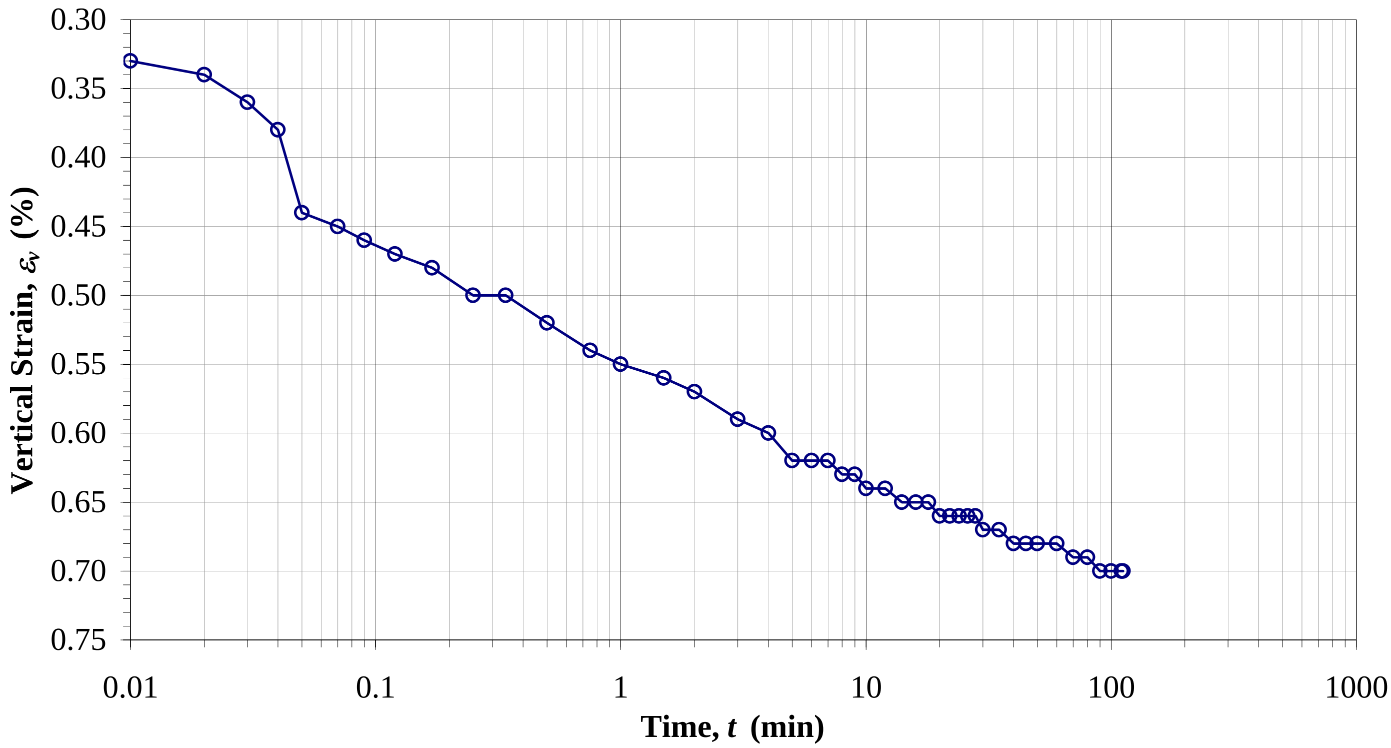


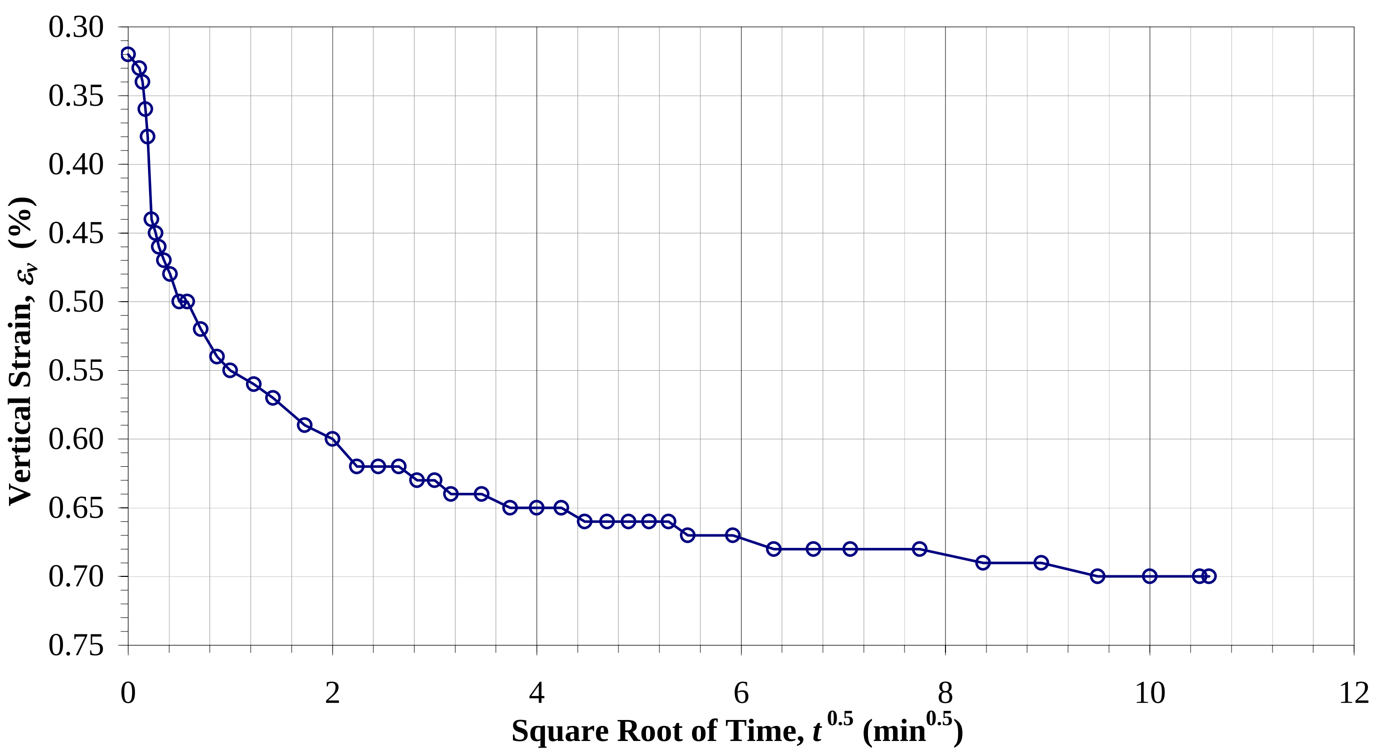
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 39.5'

Constant Load Step: 4 of 14
Stress: 800 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP

No: 00823-012

Location: Logan, Utah

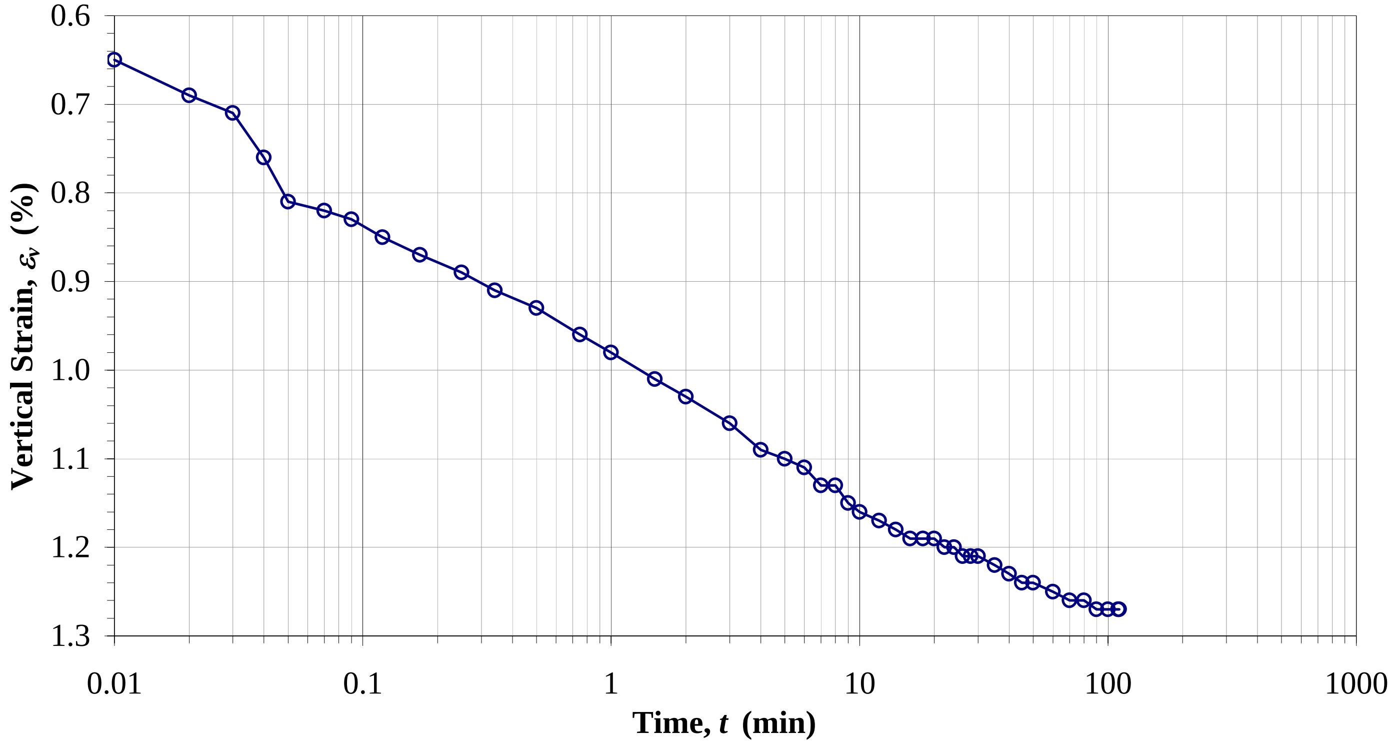
Boring No.: B-09

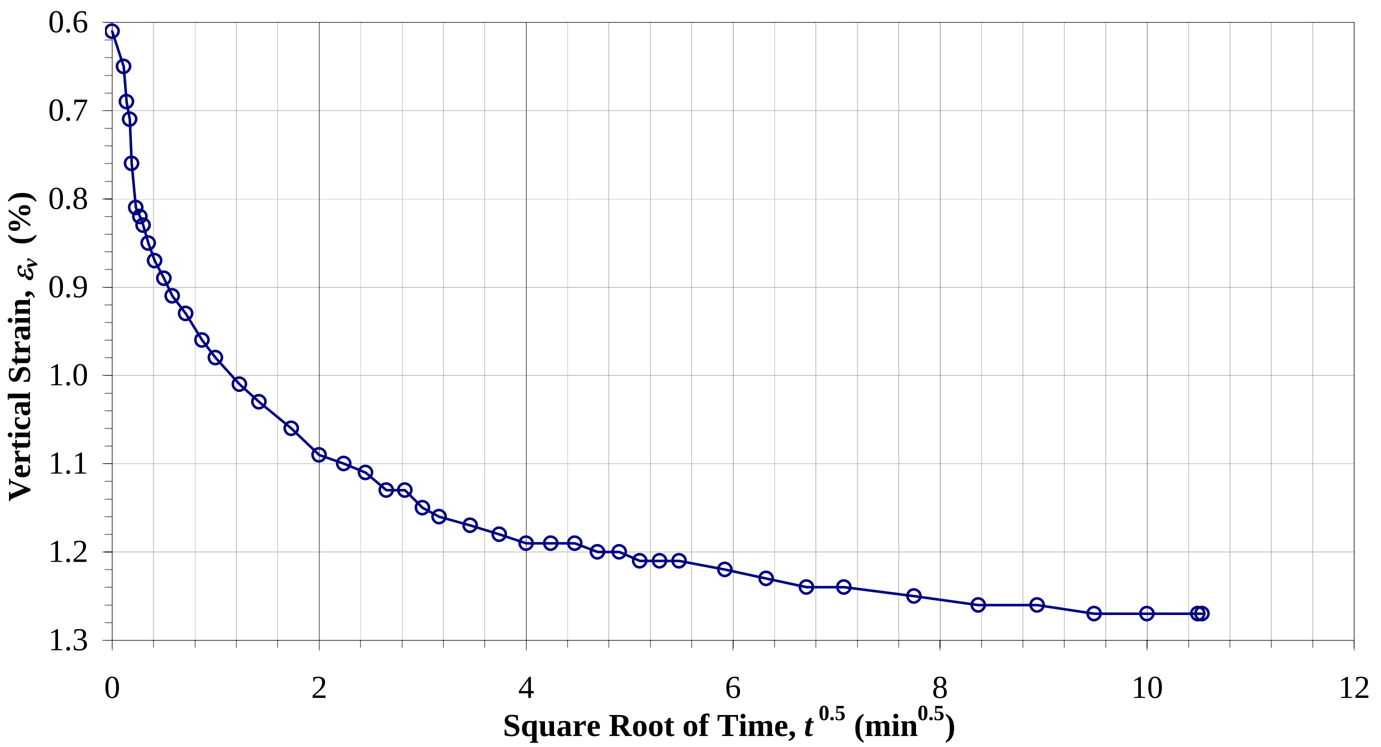
Sample:

Depth: 39.5'

Constant Load Step: 5 of 14

Stress: 1600 psf



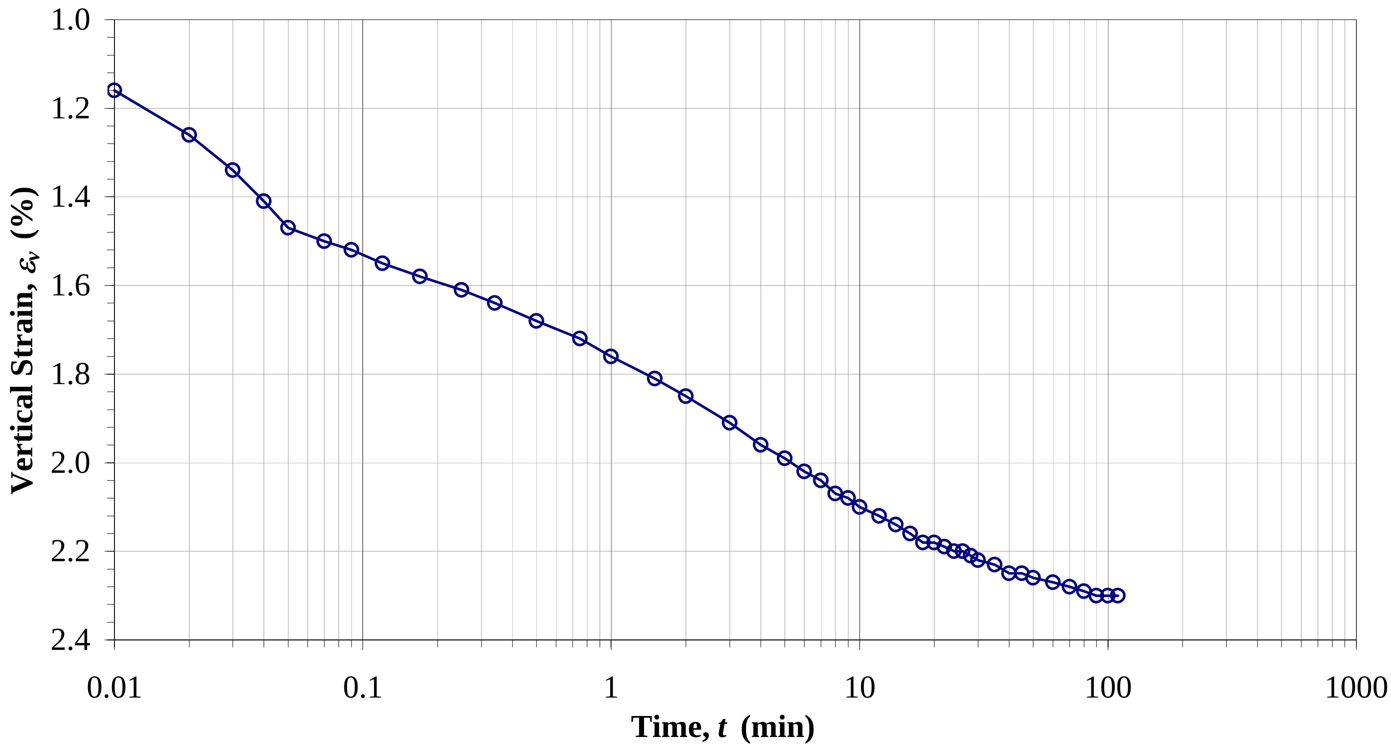


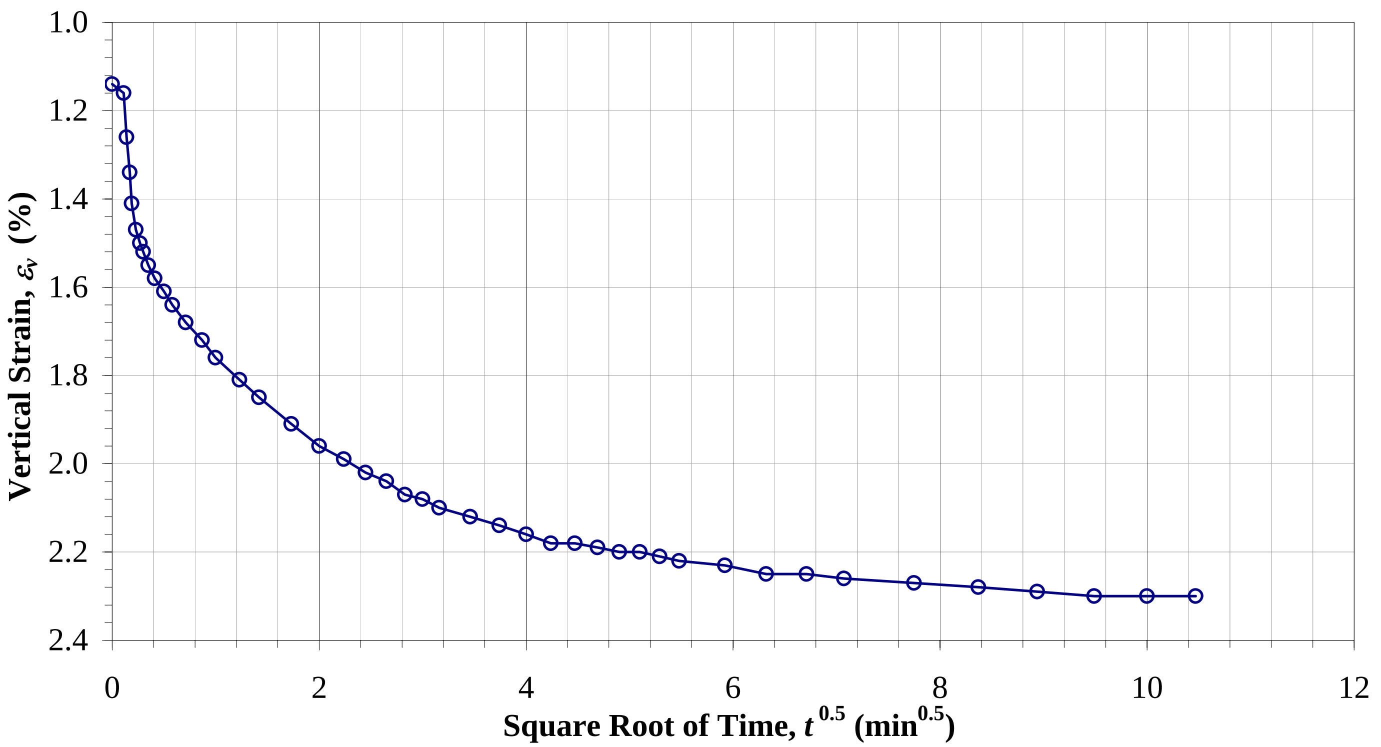
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 39.5'

Constant Load Step: 6 of 14
Stress: 3200 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP

No: 00823-012

Location: Logan, Utah

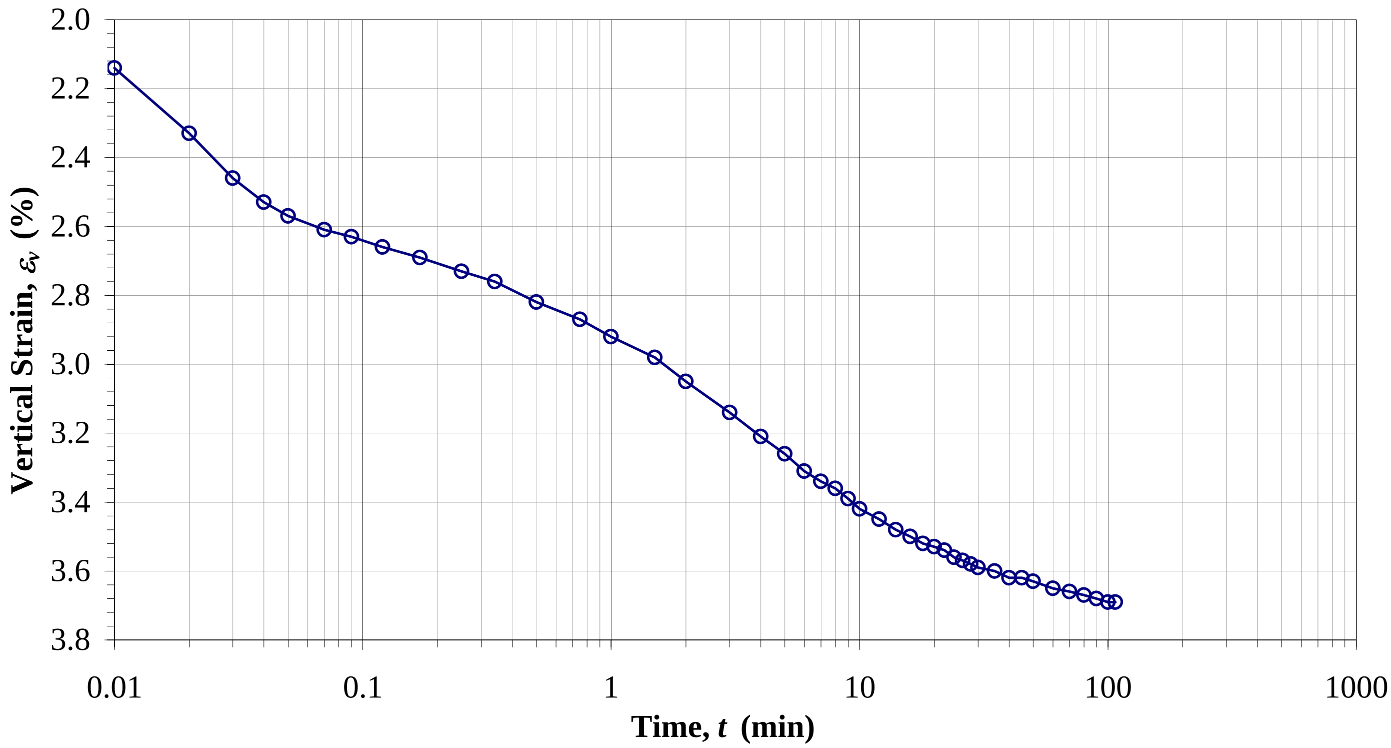
Boring No.: B-09

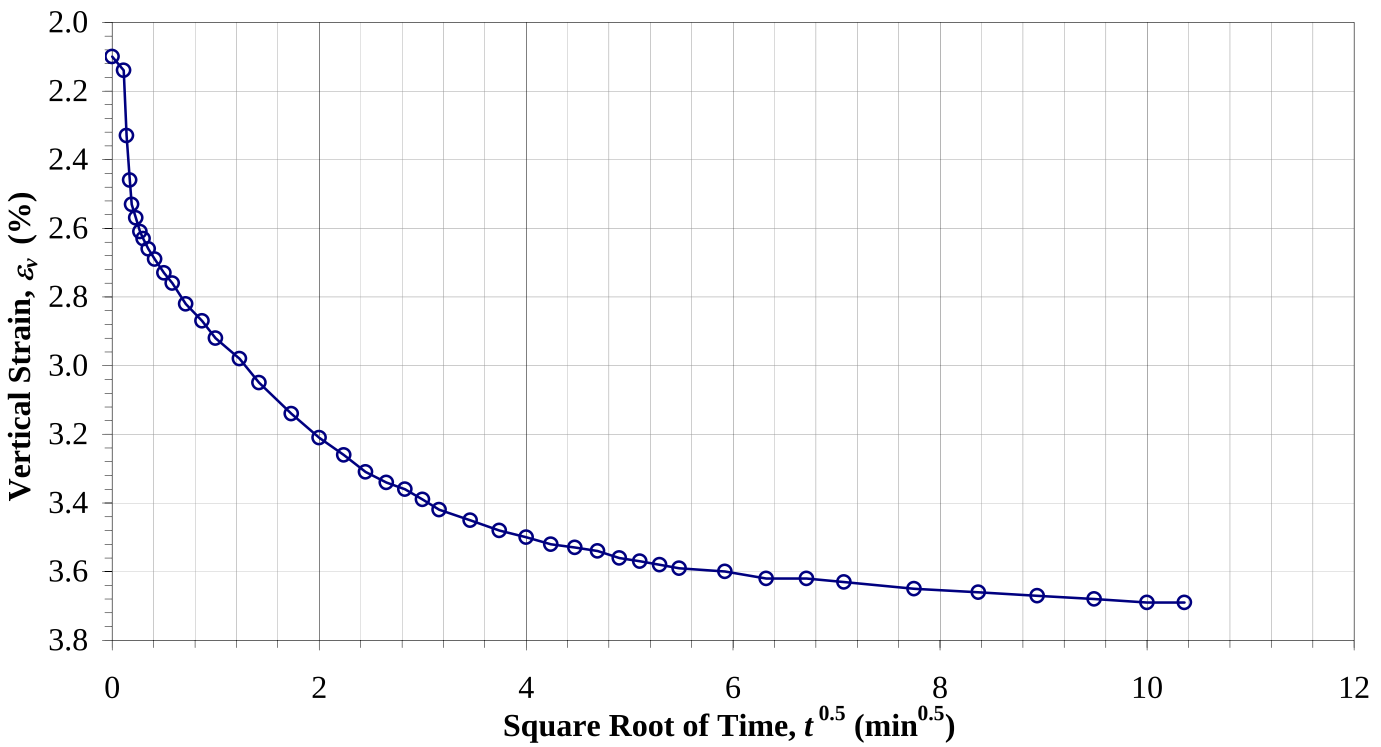
Sample:

Depth: 39.5'

Constant Load Step: 7 of 14

Stress: 6400 psf



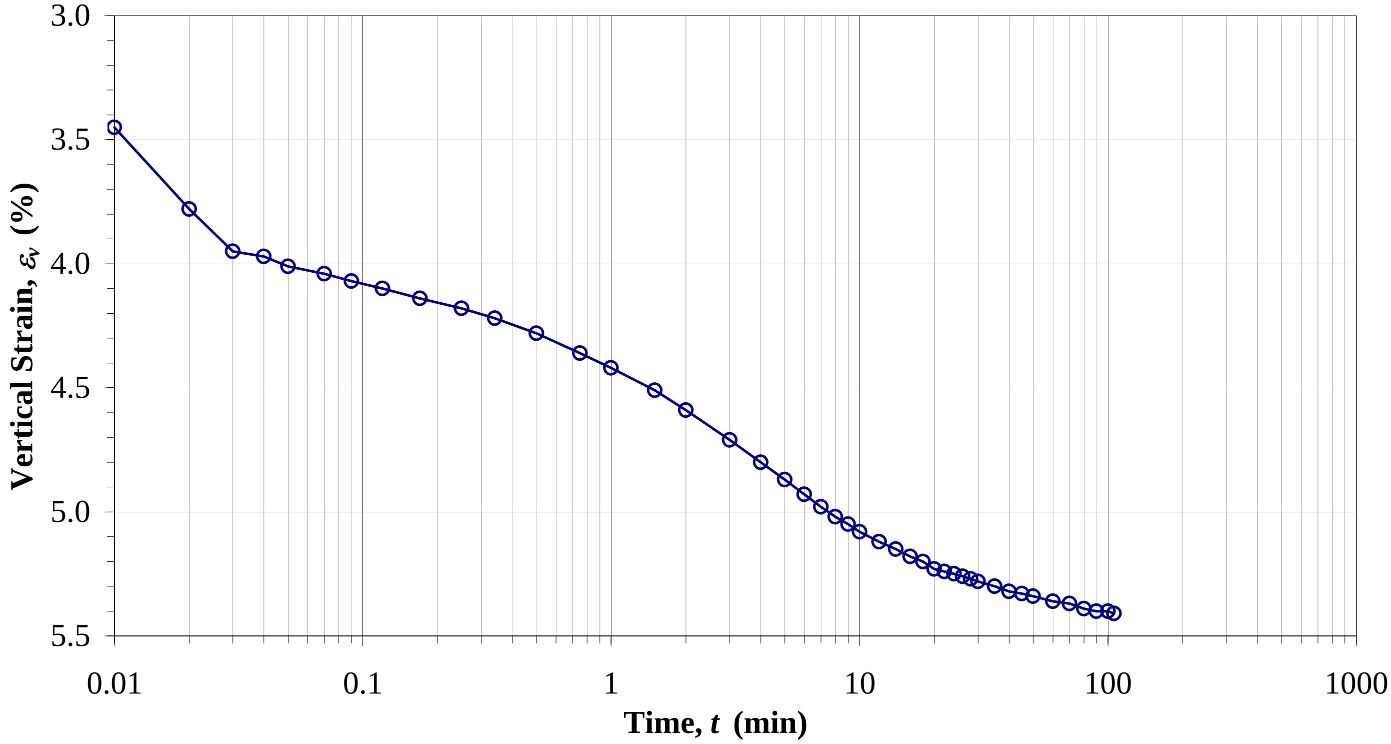


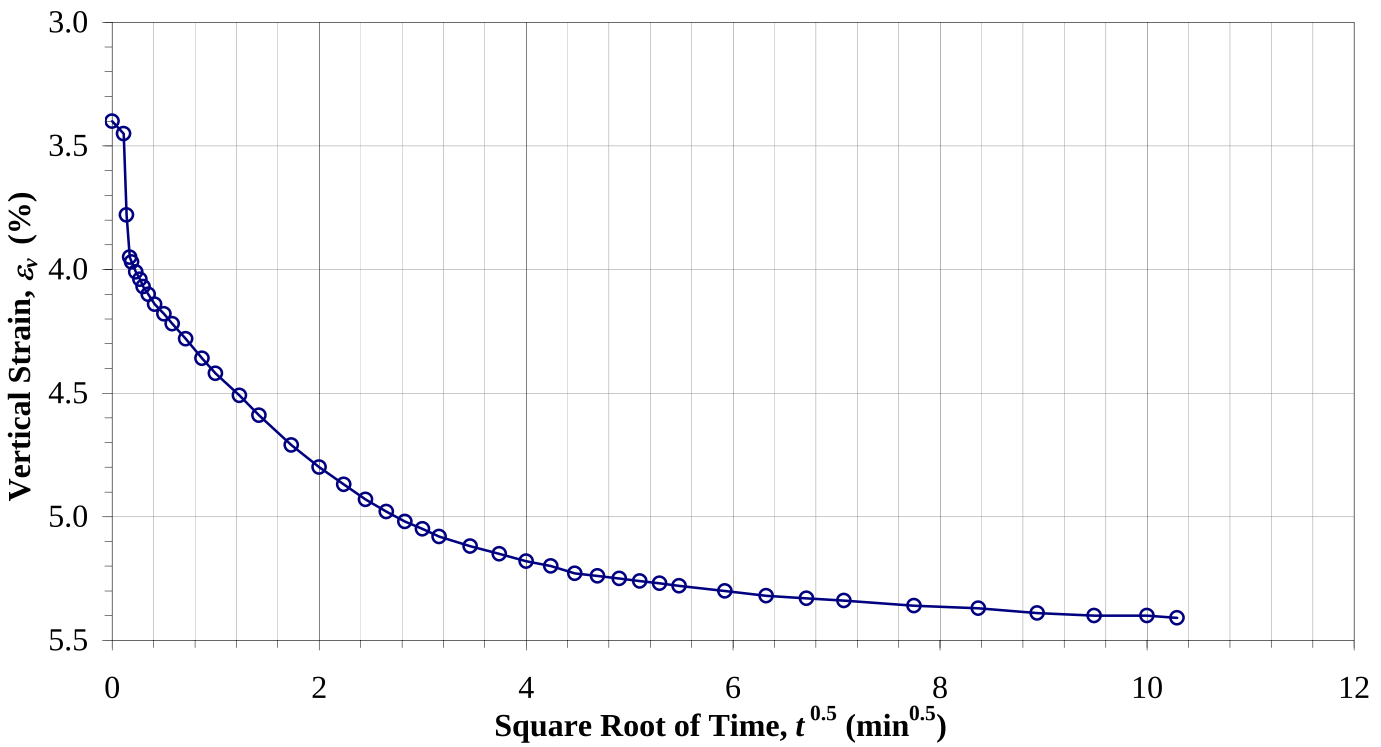
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 39.5'

Constant Load Step: 8 of 14
Stress: 12800 psf



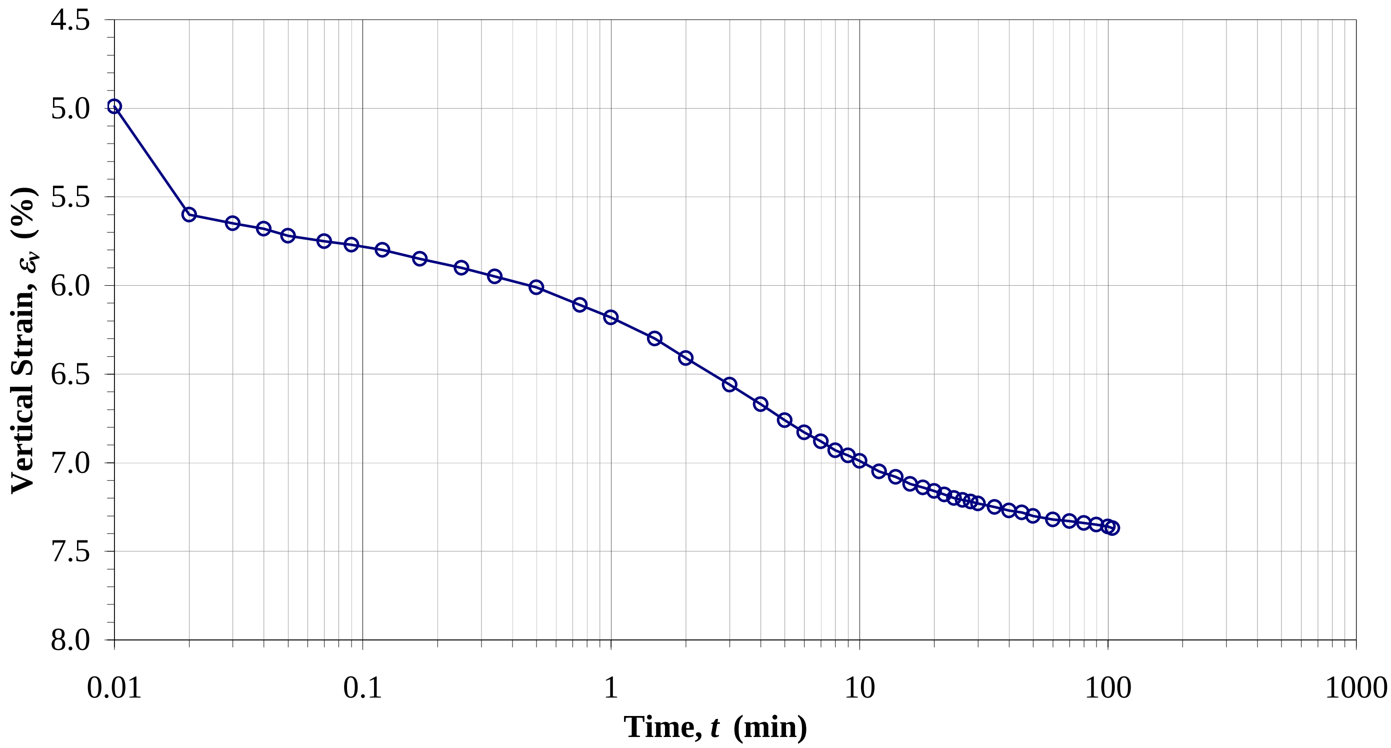


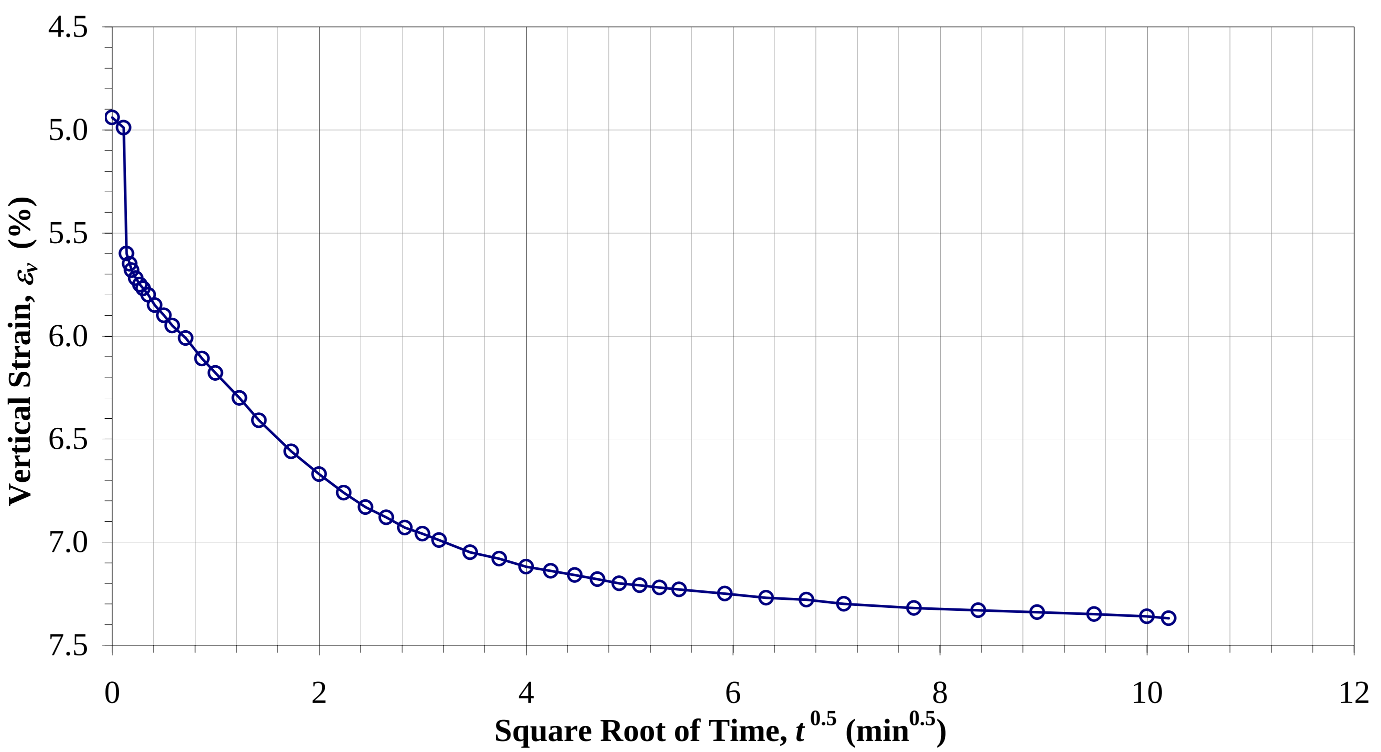
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 39.5'

Constant Load Step: 9 of 14
Stress: 25600 psf





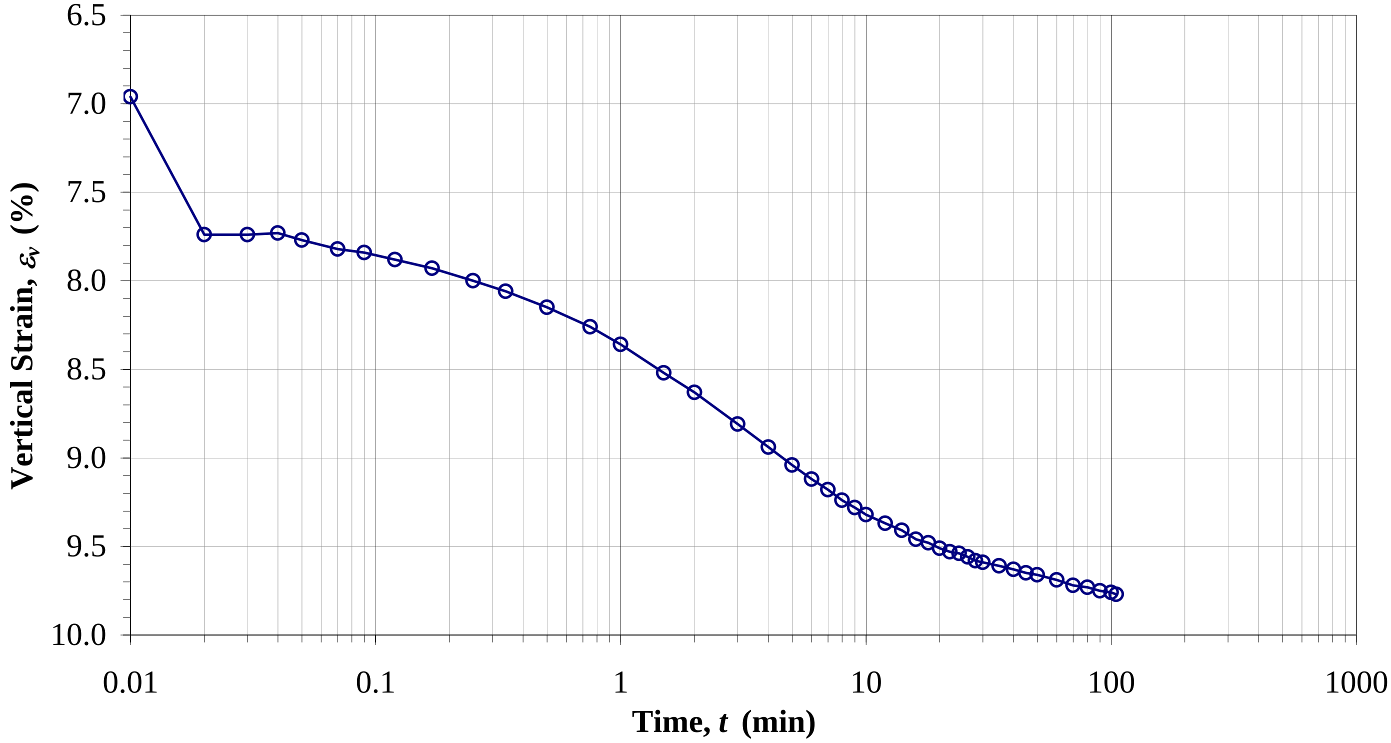
One-Dimensional Consolidation Properties of Soils

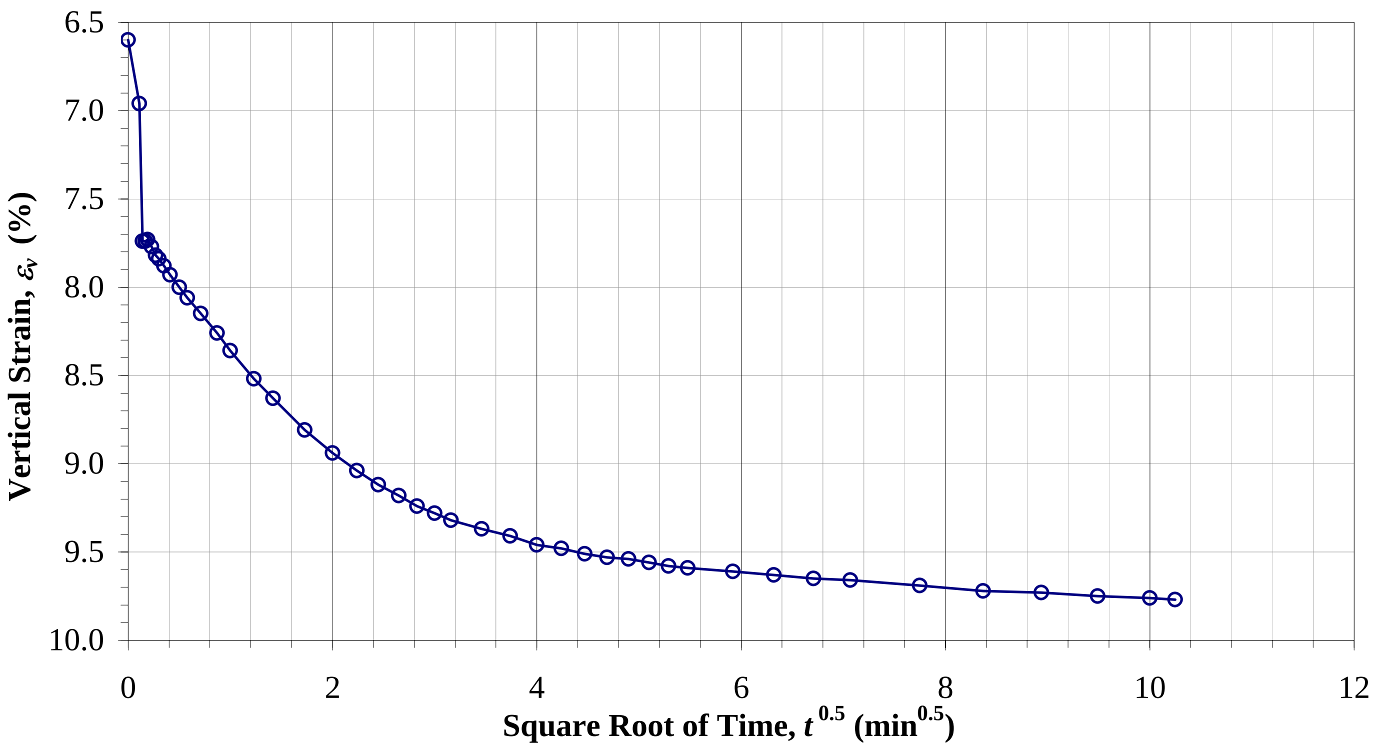
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 39.5'

Constant Load Step: 10 of 14
Stress: 51200 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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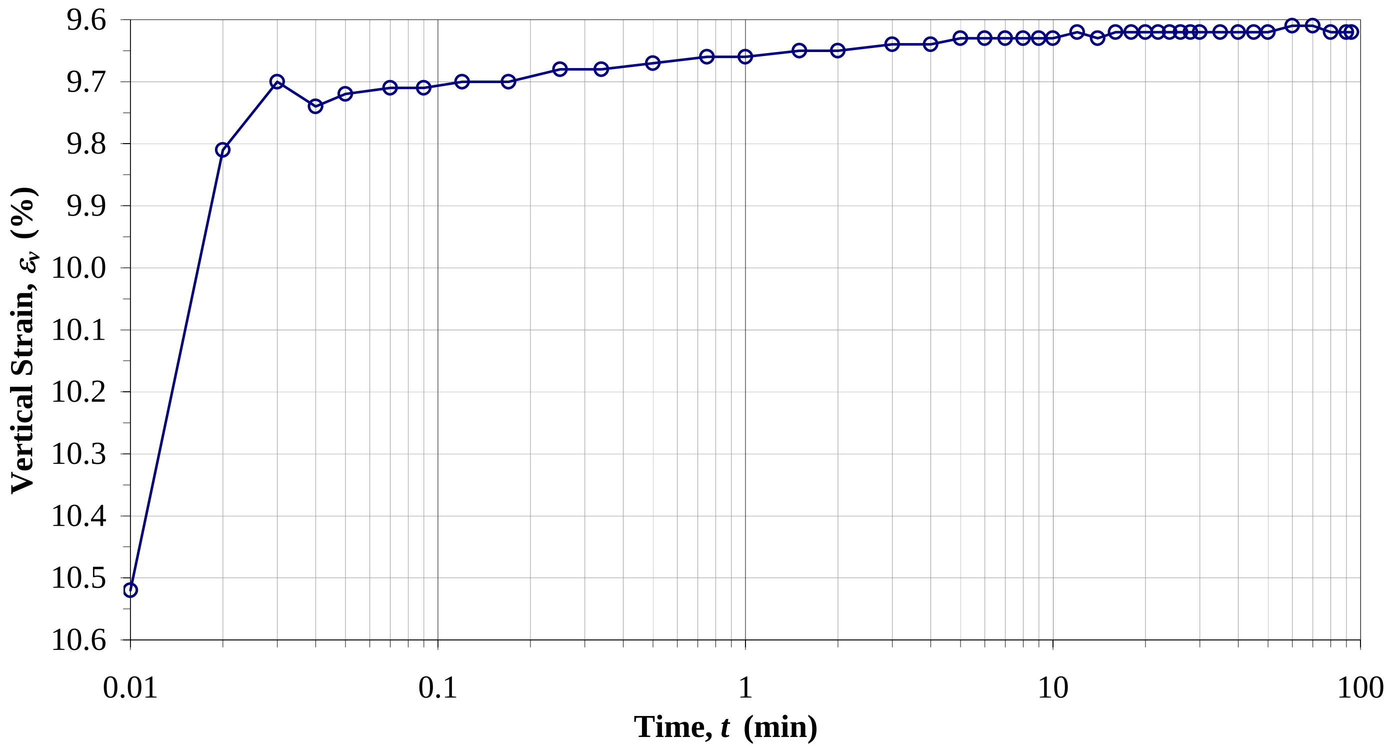
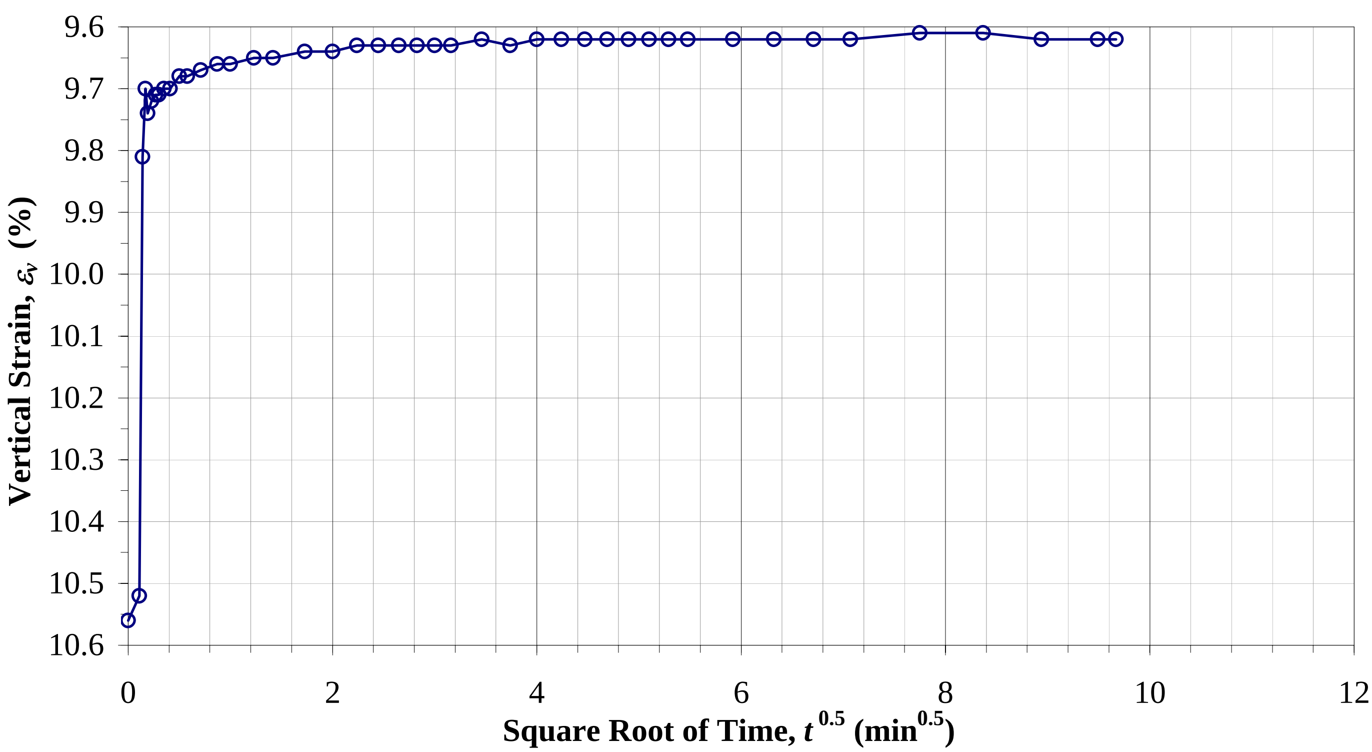
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 39.5'

Constant Load Step: 11 of 14
Stress: 25600 psf





<u>One-Dimensional Consolidation Properties of Soils</u>
(ASTM D2435)

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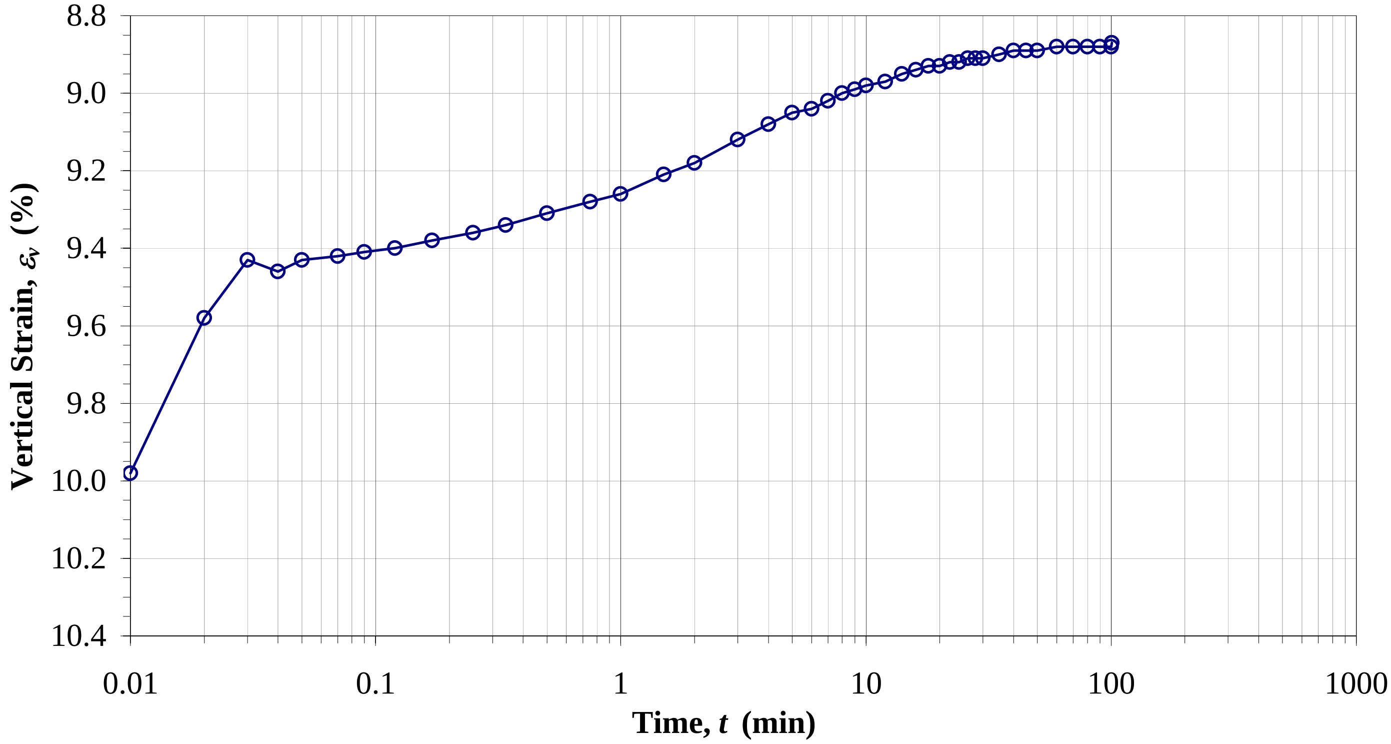
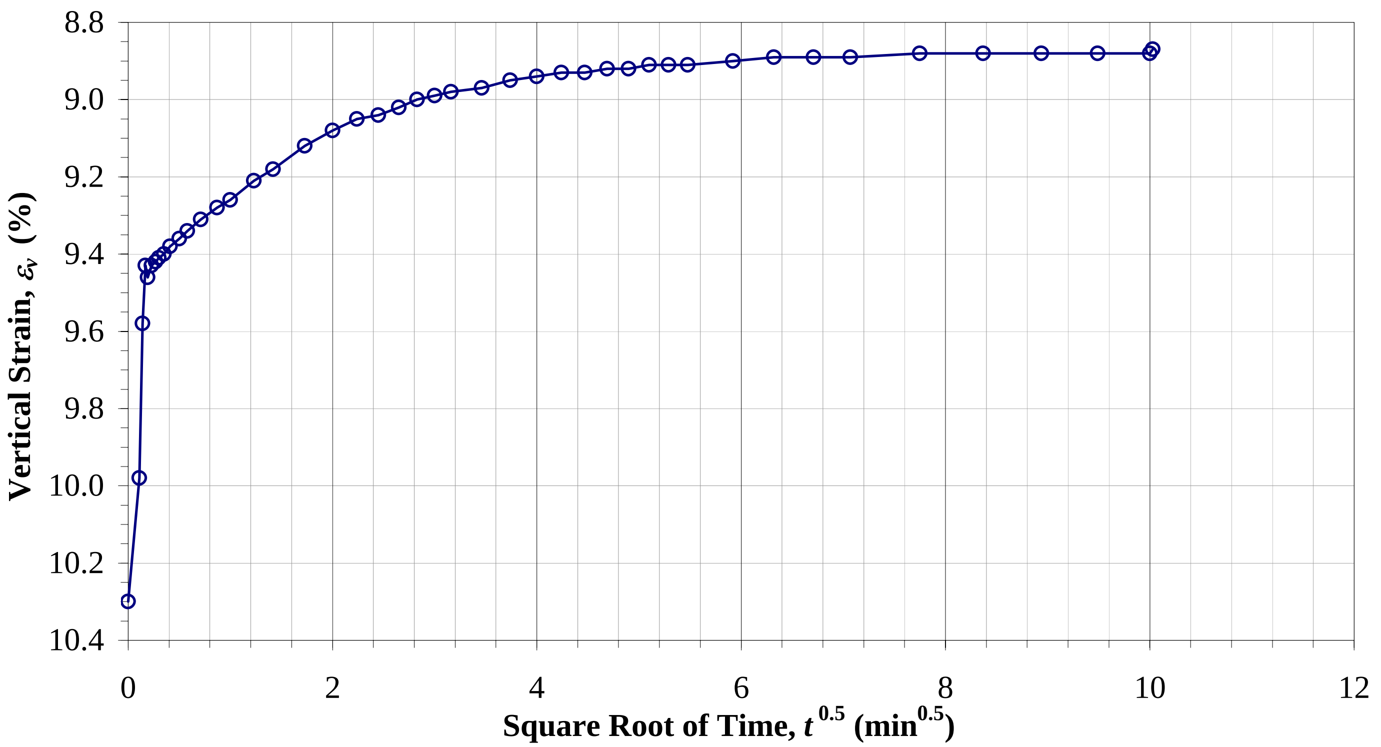
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-09
Sample:
Depth: 39.5'

Constant Load Step: 12 of 14
Stress: 6400 psf





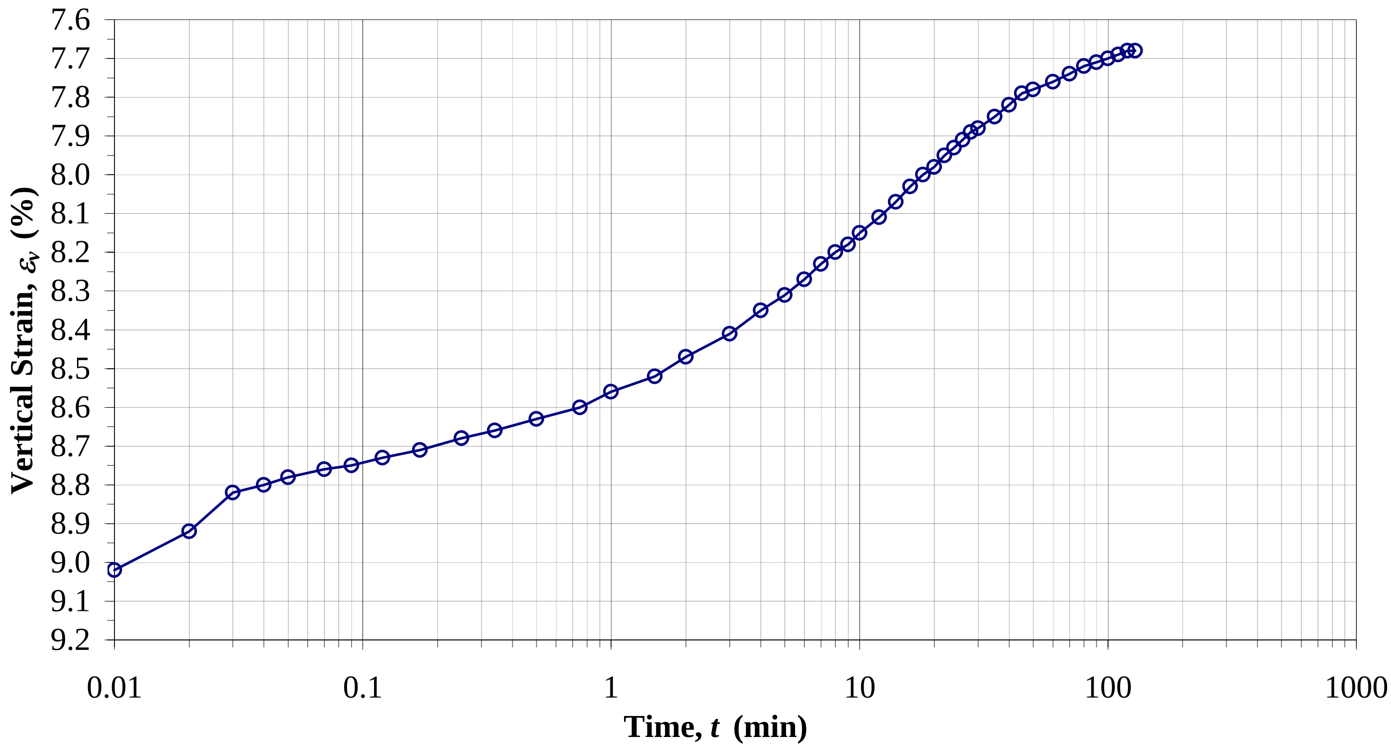
One-Dimensional Consolidation Properties of Soils

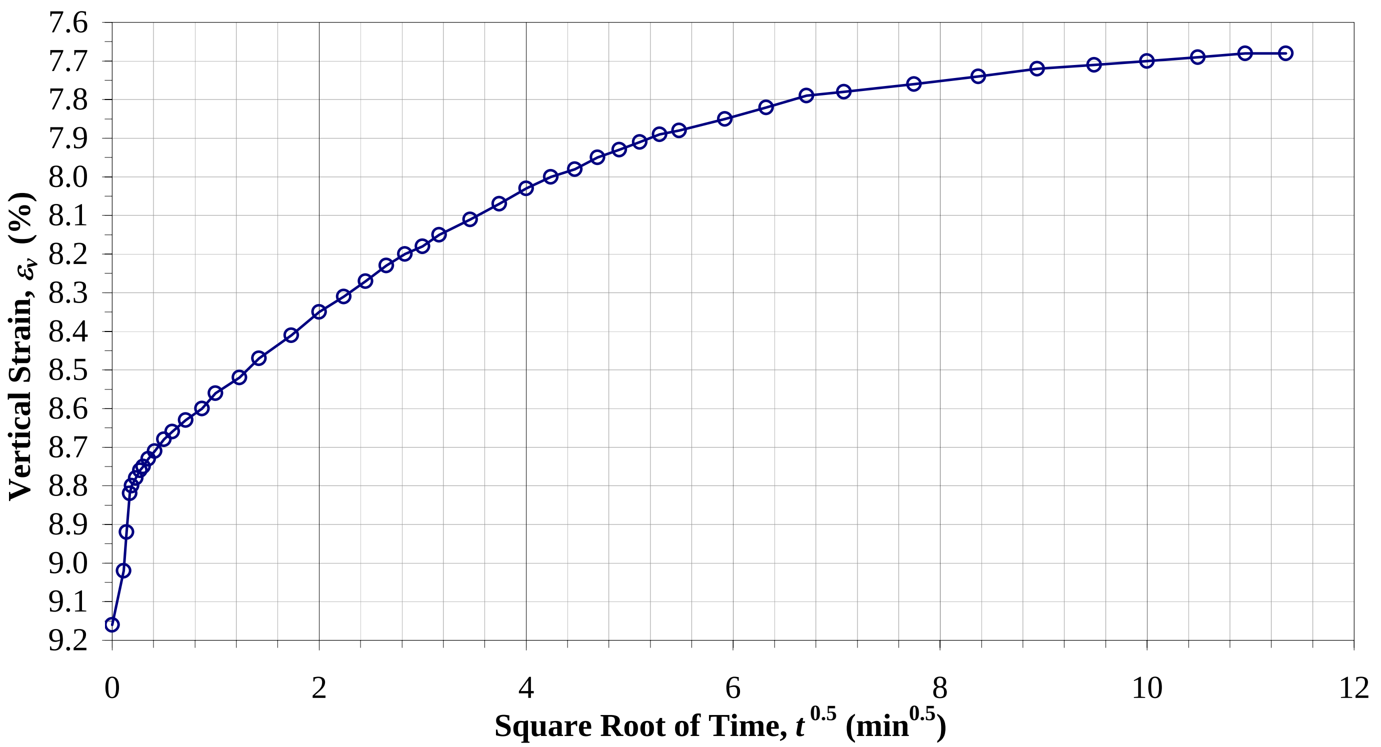
(ASTM D2435)

Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah

Boring No.: **B-09**
Sample:
Depth: **39.5'**

Constant Load Step: 13 of 14
Stress: 1600 psf



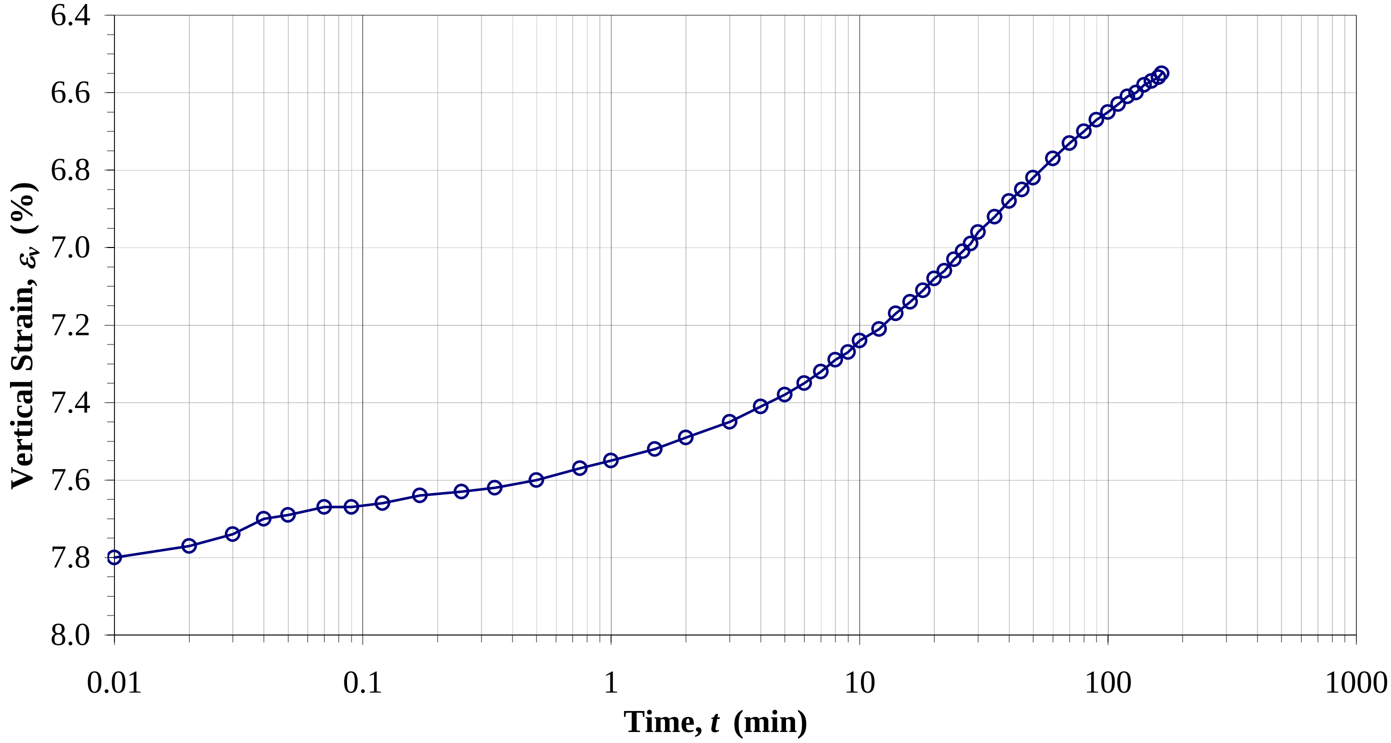


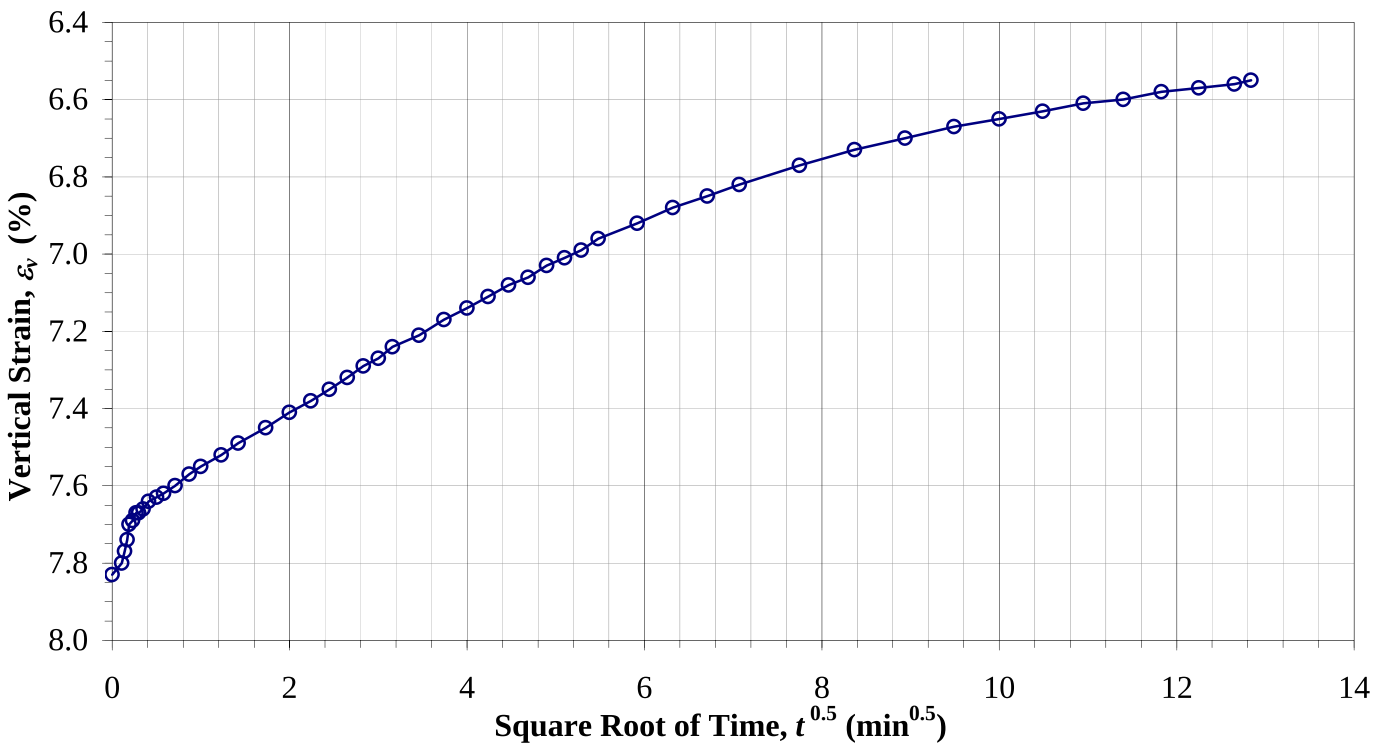
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

IGES

Project: **Logan WWTP** **Boring No.:** **B-09**
No: **00823-012** **Sample:**
Location: Logan, Utah **Depth:** **39.5'**

Constant Load Step: 14 of 14
Stress: 400 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

© IGES 2011, 2013

Project: **Logan WWTP**
No: **00823-012**
Location: Logan, Utah
Date: 2/27/2013
By: JDF

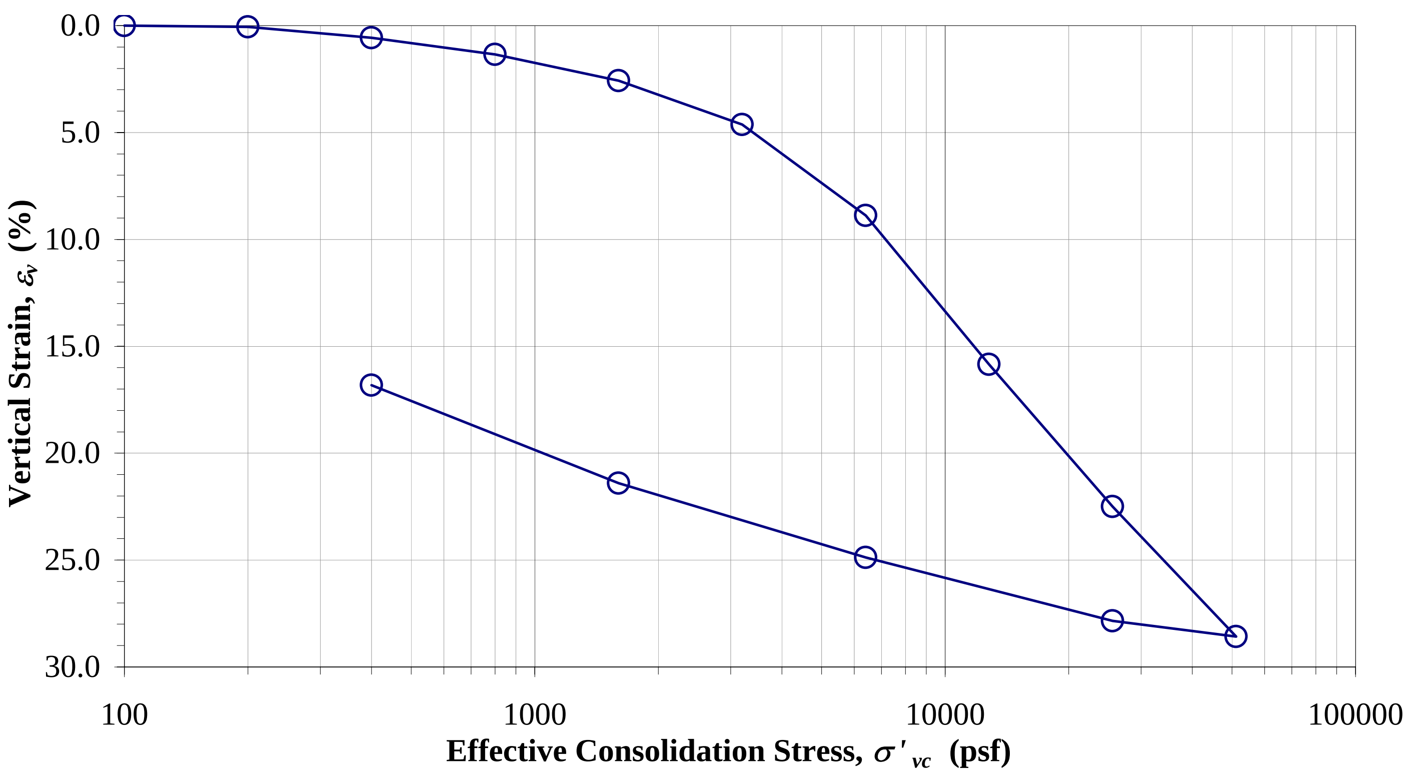
Boring No.: **B-11**
Sample:
Depth: **14.5'**
Sample Description: Grey clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from Shelby tube

Test method:	B	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.8318
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	176.72	164.73
Wt. rings/tare (g)	46.02	46.02
Total unit wt., γ (pcf)	108.6	118.6
Wet soil + tare (g)	446.67	
Dry soil + tare (g)	339.07	
Tare (g)	124.49	
Water content, ω (%)	50.1	36.4
Dry unit wt., γ_d (pcf)	72.3	87.0
Saturation, S	1.00	1.00

*Note: C_v, C_c, C_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0000	0.00	1.0000	1.3043
100	0.0000	0.00	1.0000	1.3042
200	0.0006	0.06	0.9994	1.3029
400	0.0056	0.56	0.9944	1.2913
800	0.0134	1.34	0.9866	1.2733
1600	0.0257	2.57	0.9743	1.2449
3200	0.0462	4.62	0.9538	1.1977
6400	0.0888	8.88	0.9112	1.0997
12800	0.1585	15.85	0.8415	0.9390
25600	0.2249	22.49	0.7751	0.7860
51200	0.2857	28.57	0.7143	0.6459
25600	0.2784	27.84	0.7216	0.6627
6400	0.2488	24.88	0.7512	0.7310
1600	0.2141	21.41	0.7859	0.8109
400	0.1682	16.82	0.8318	0.9167



Comments: Specimen swelled upon inundation and at the 100 psf loading.

Entered: ________
Reviewed: ________

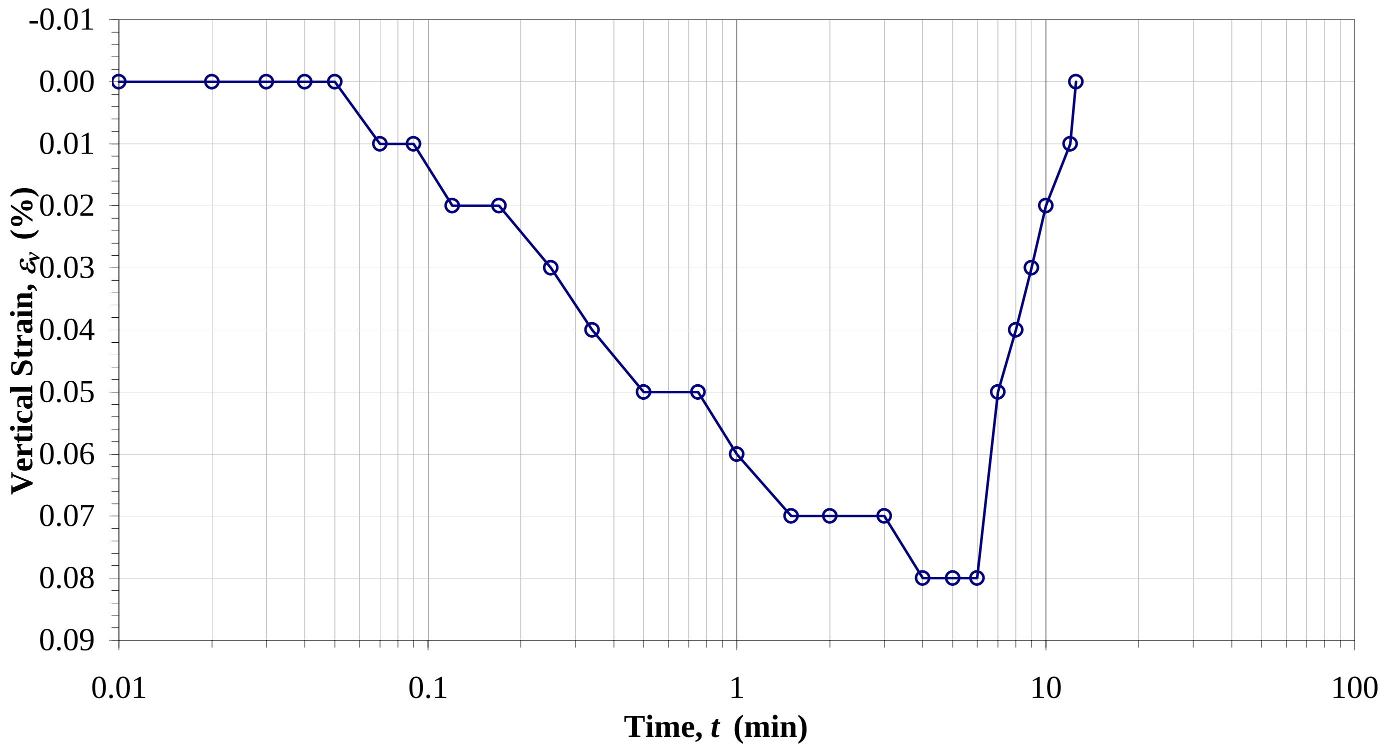
Z:\PROJECTS\00823_Carollo\012_Logan_WWTP\[CONSOL_GC+TRv1_B-11_14.5.xls]CON

One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-11
Sample:
Depth: 14.5'

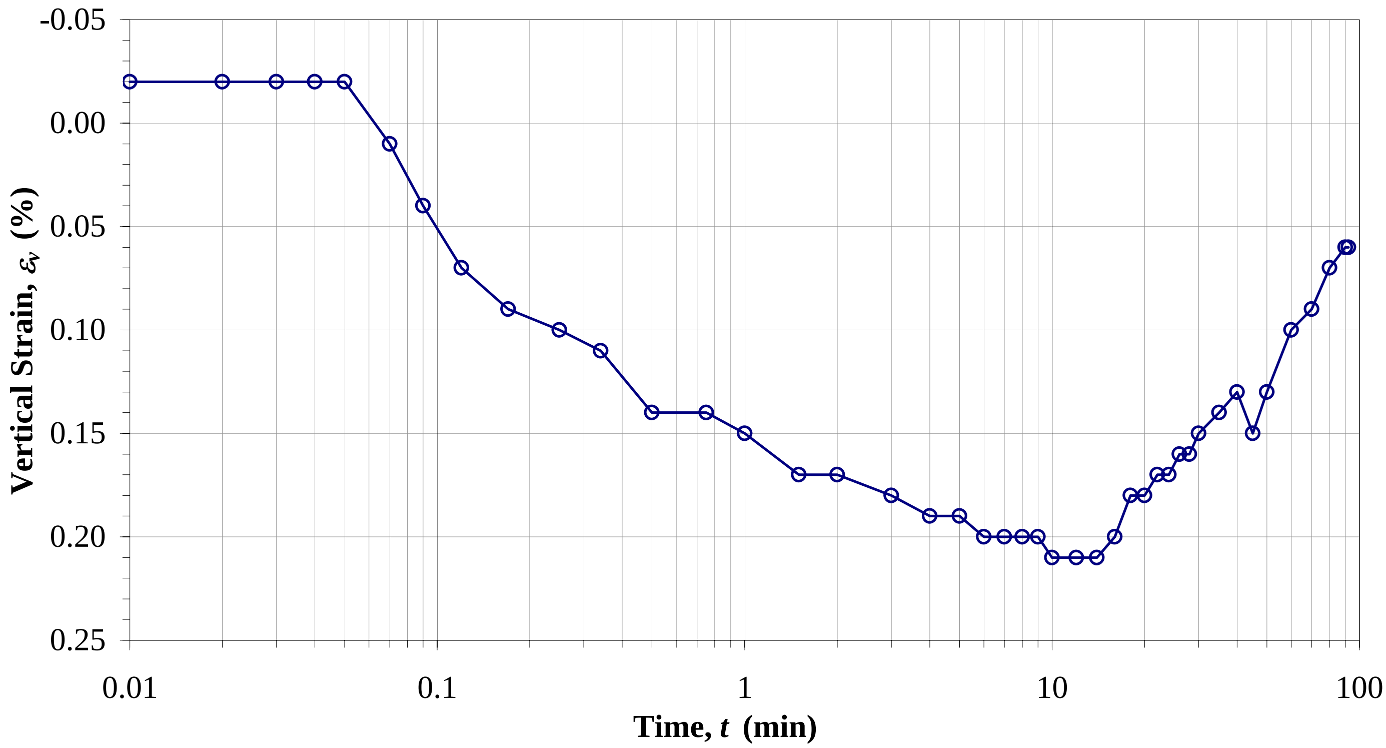
Constant Load Step: 1 of 14
Stress: 100 psf

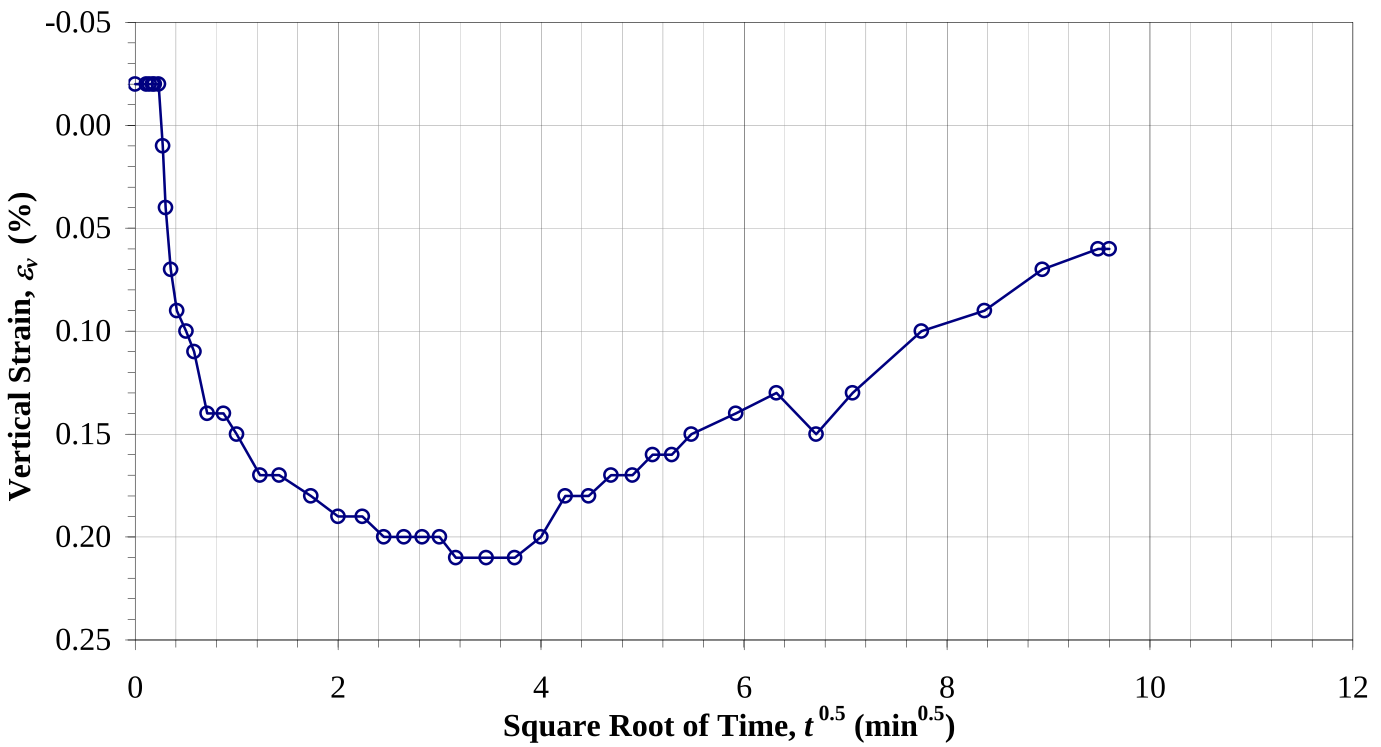


One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: **Logan WWTP** | **Boring No.:** **B-11**
No: **00823-012** | **Sample:**
Location: Logan, Utah | **Depth:** **14.5'**

Constant Load Step: 2 of 14
Stress: 200 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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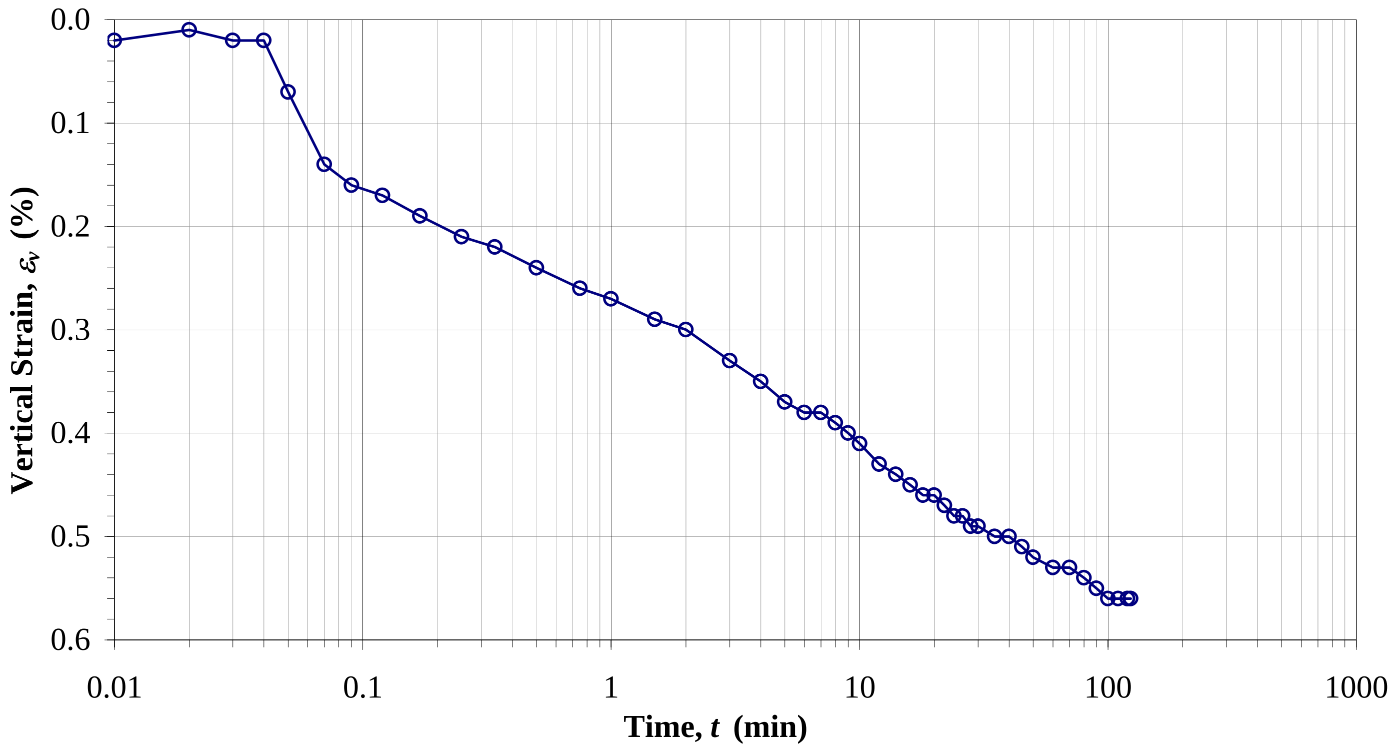
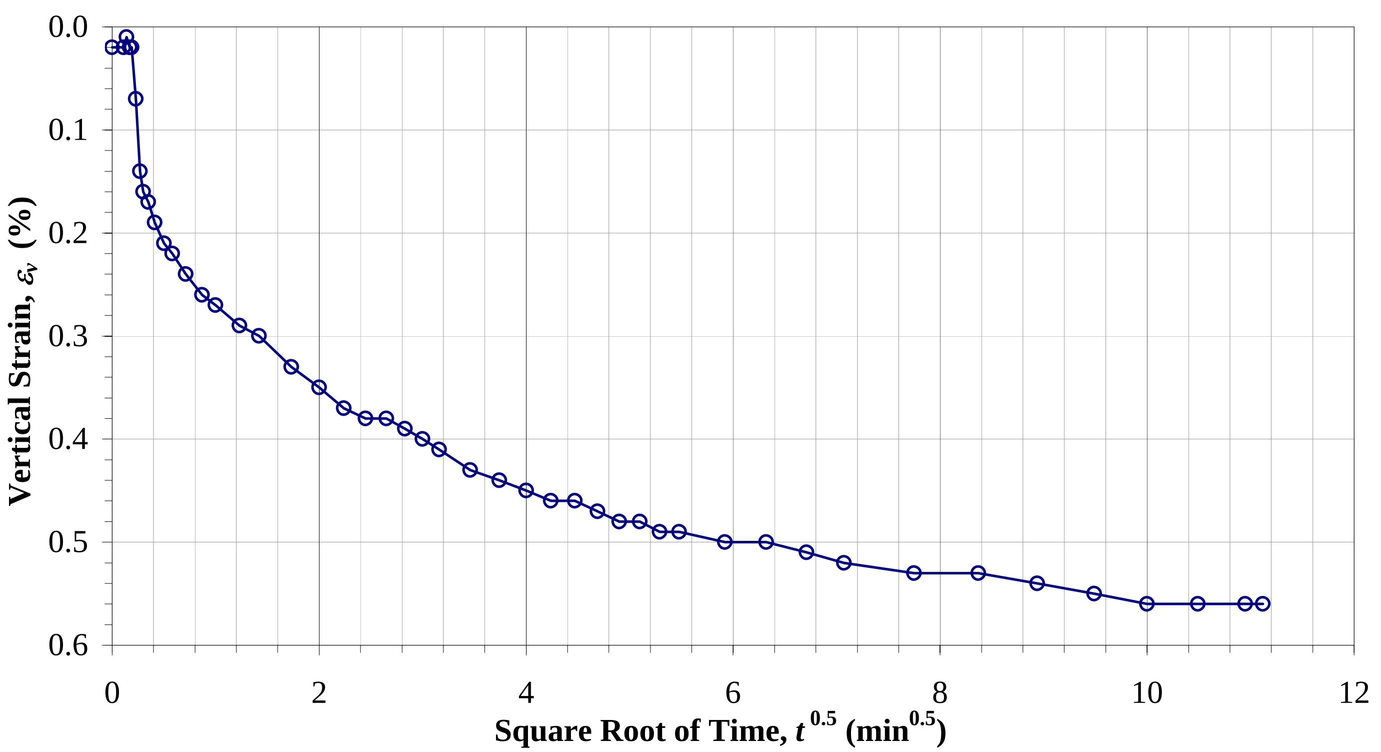
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-11
Sample:
Depth: 14.5'

Constant Load Step: 3 of 14
Stress: 400 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP

No: 00823-012

Location: Logan, Utah

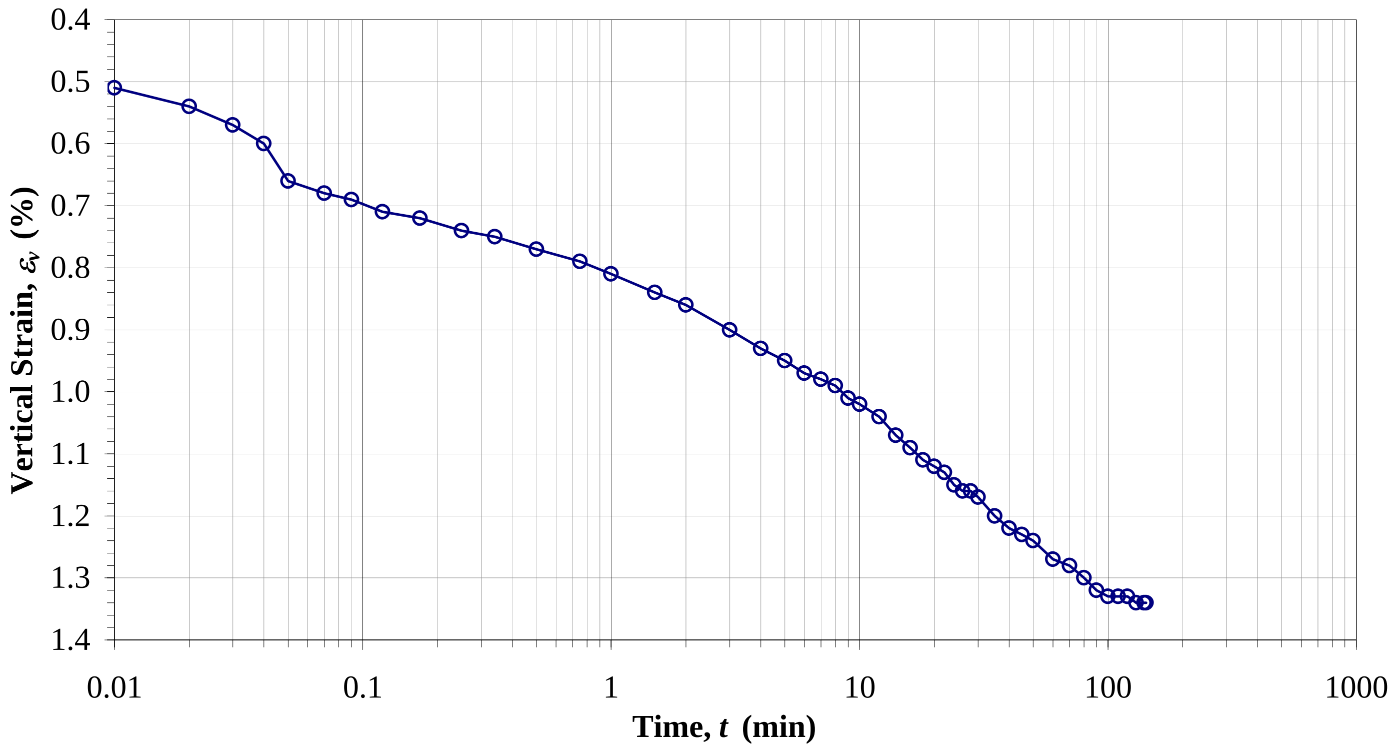
Boring No.: B-11

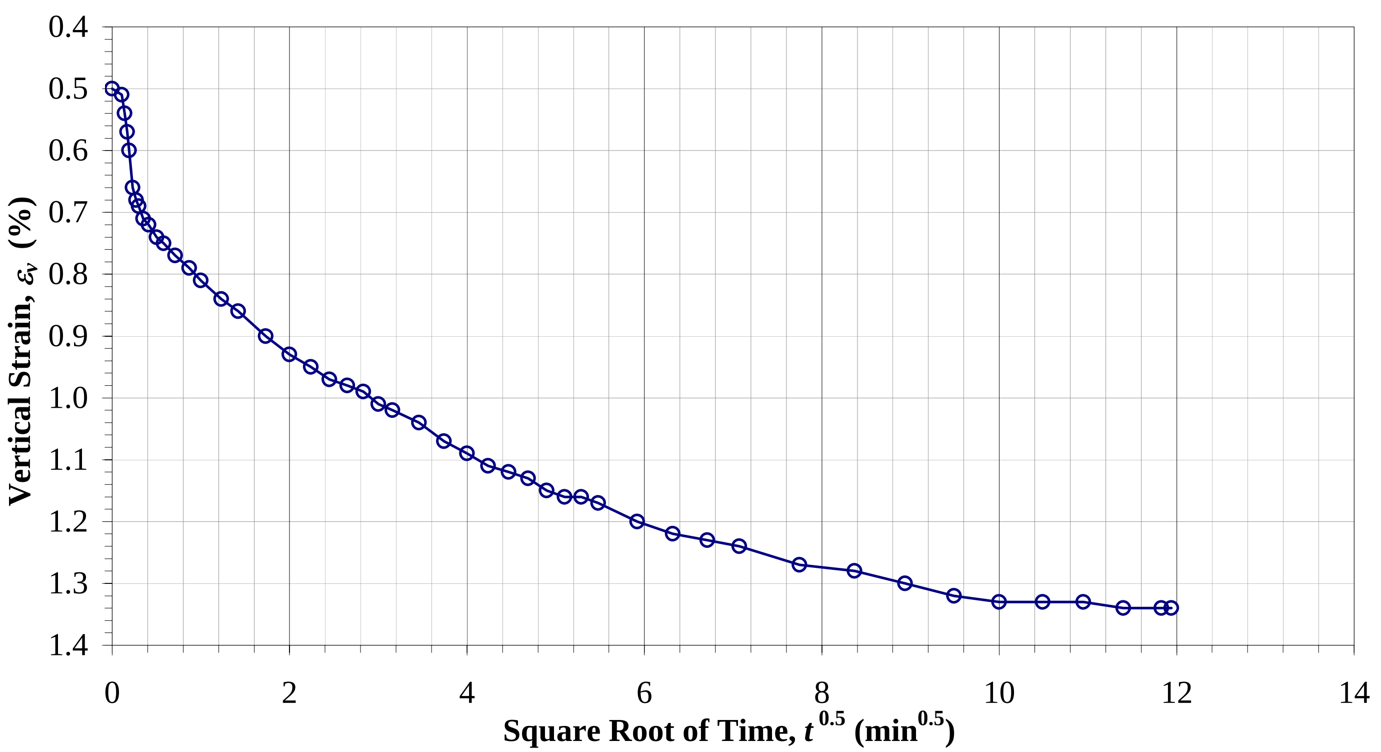
Sample:

Depth: 14.5'

Constant Load Step: 4 of 14

Stress: 800 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

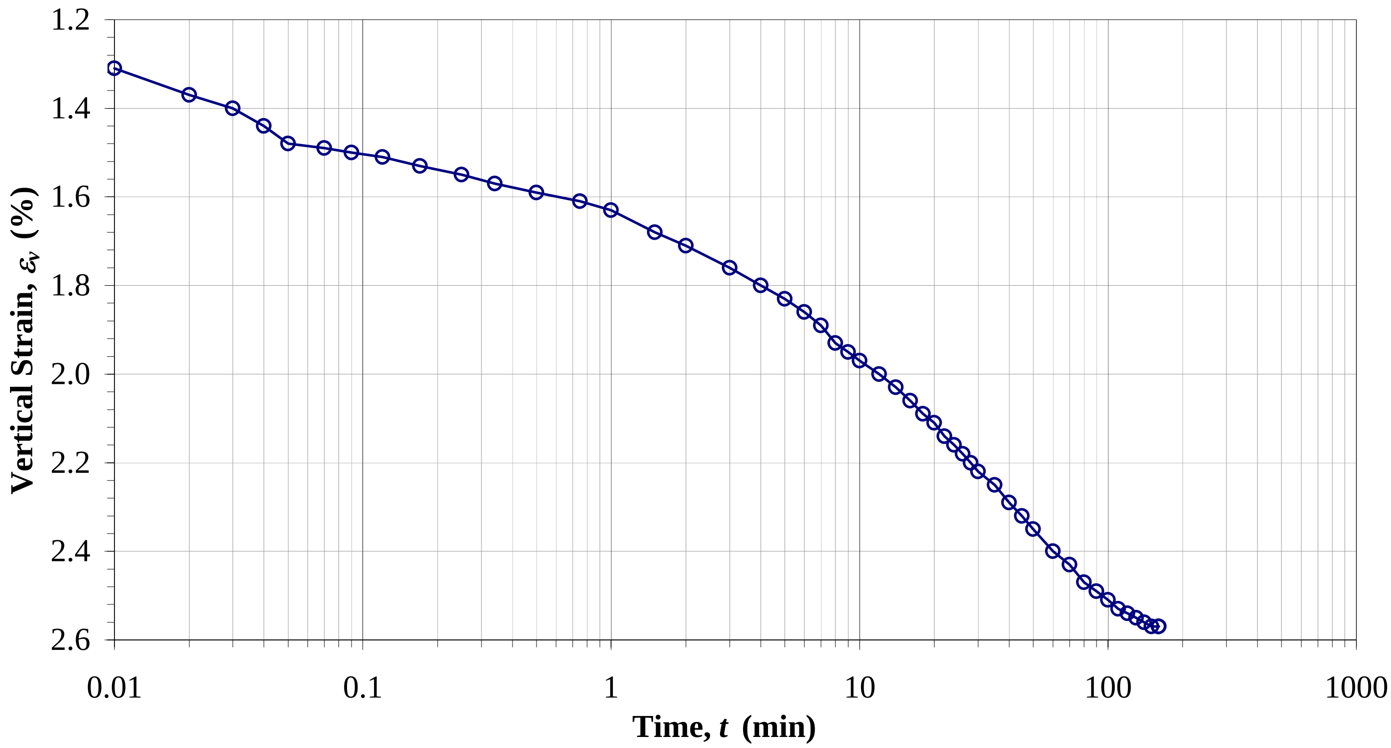
Project: **Logan WWTP** **Boring No.:** **B-11**

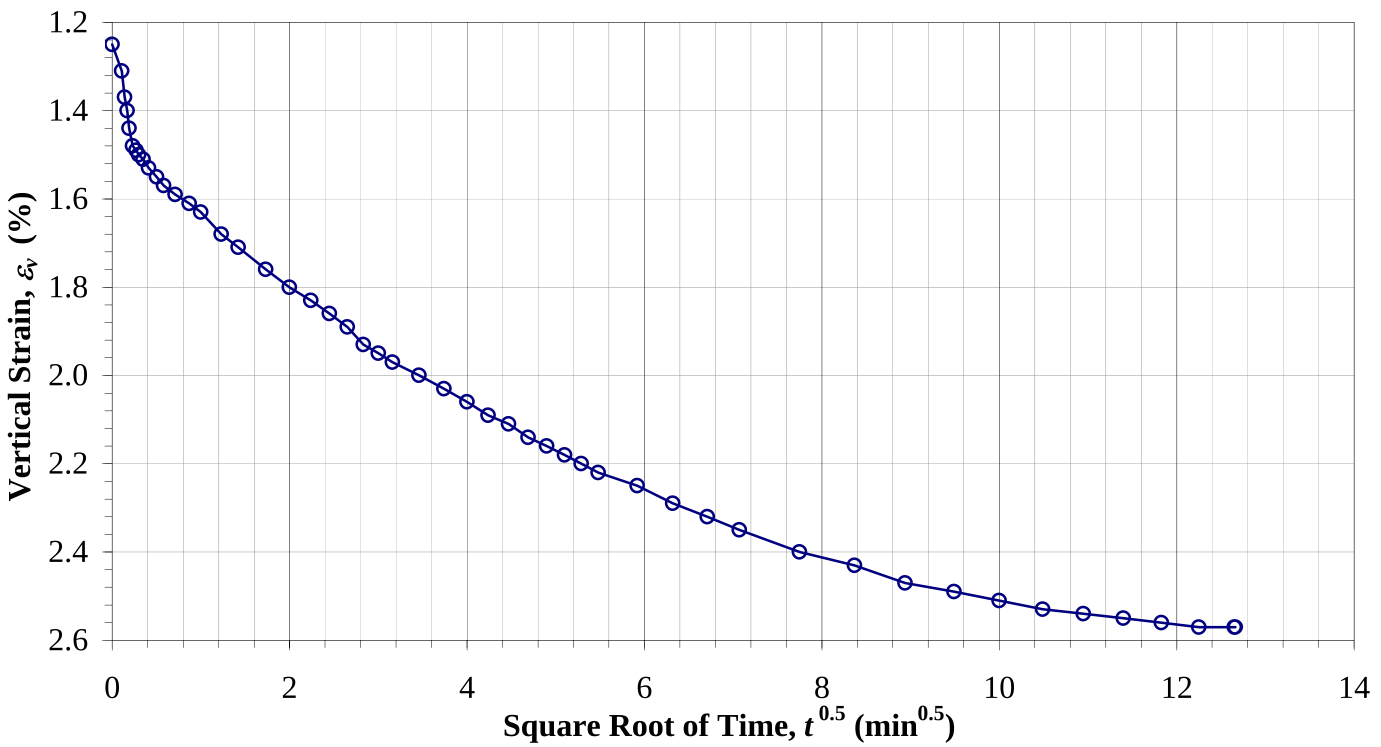
No: **00823-012** **Sample:**

Location: Logan, Utah **Depth:** **14.5'**

Constant Load Step: 5 of 14

Stress: 1600 psf





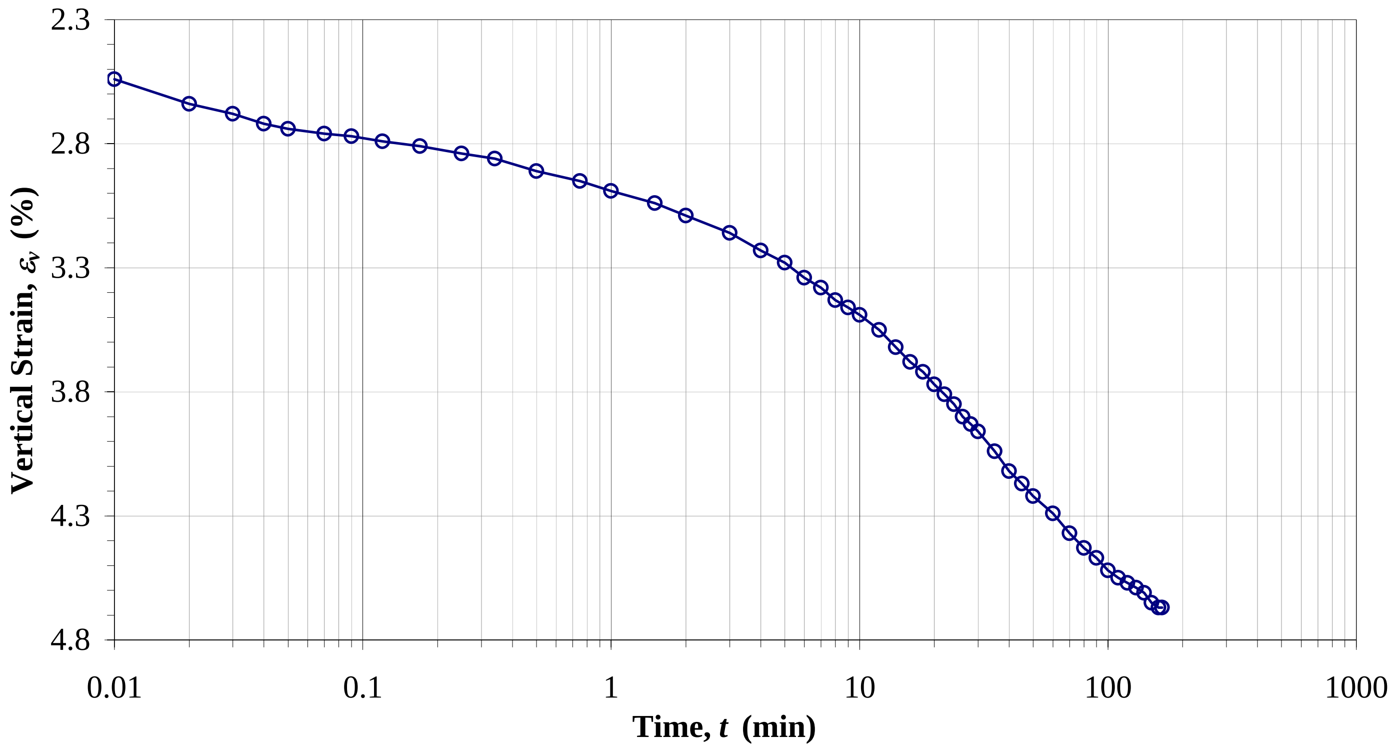
One-Dimensional Consolidation Properties of Soils

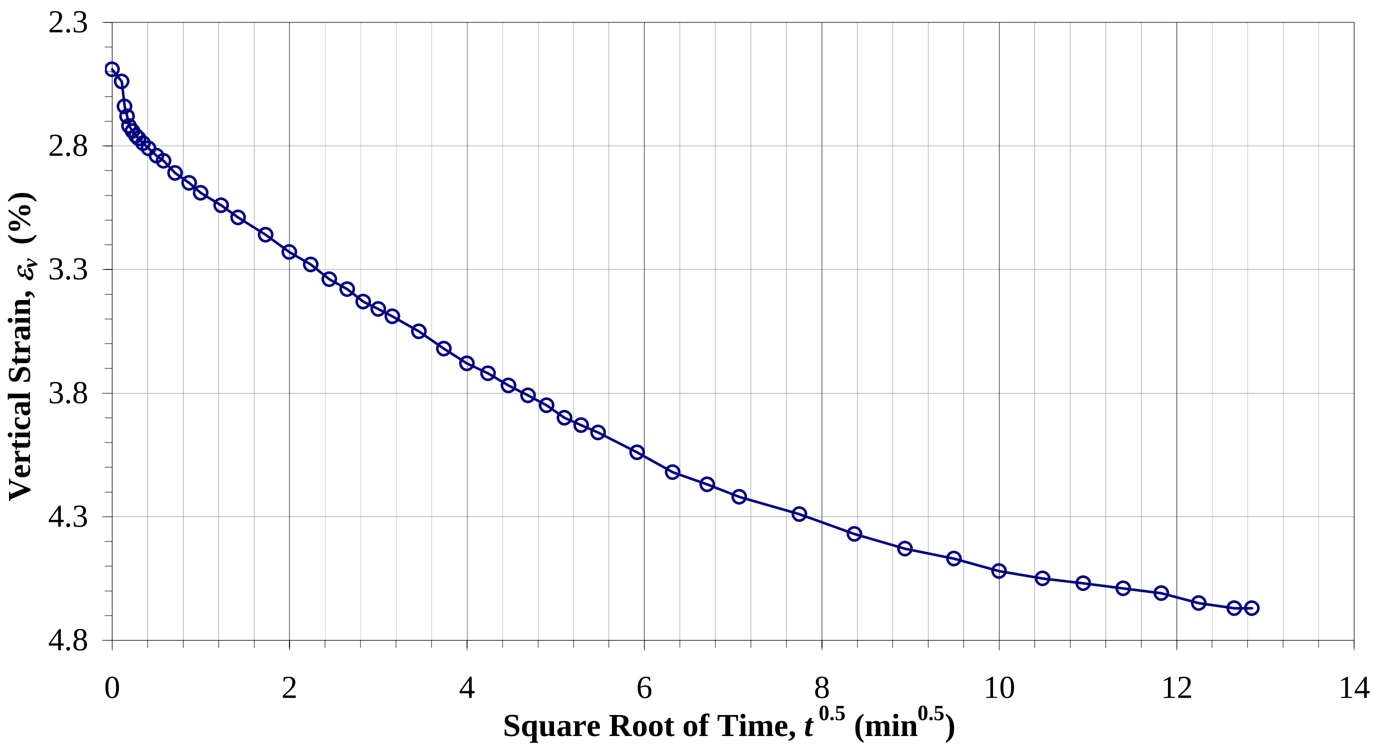
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-11
Sample:
Depth: 14.5'

Constant Load Step: 6 of 14
Stress: 3200 psf





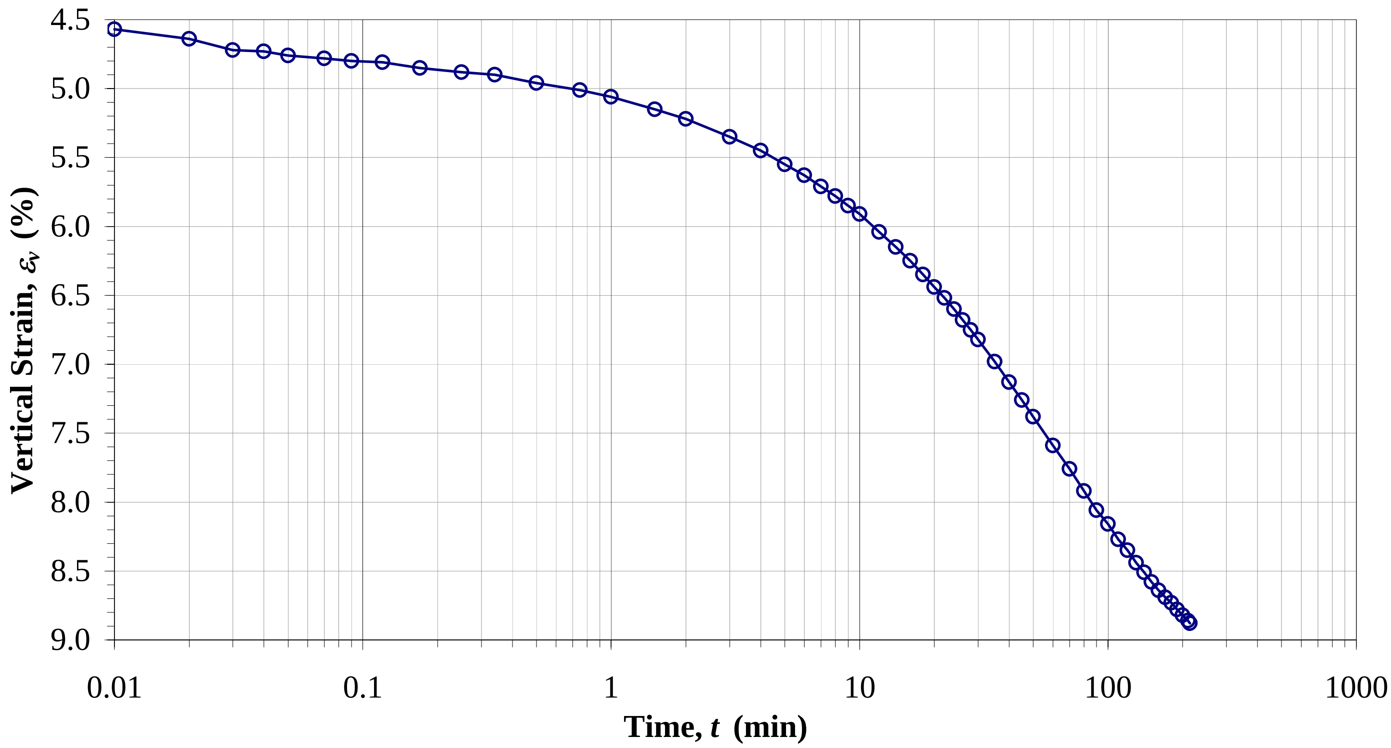
One-Dimensional Consolidation Properties of Soils

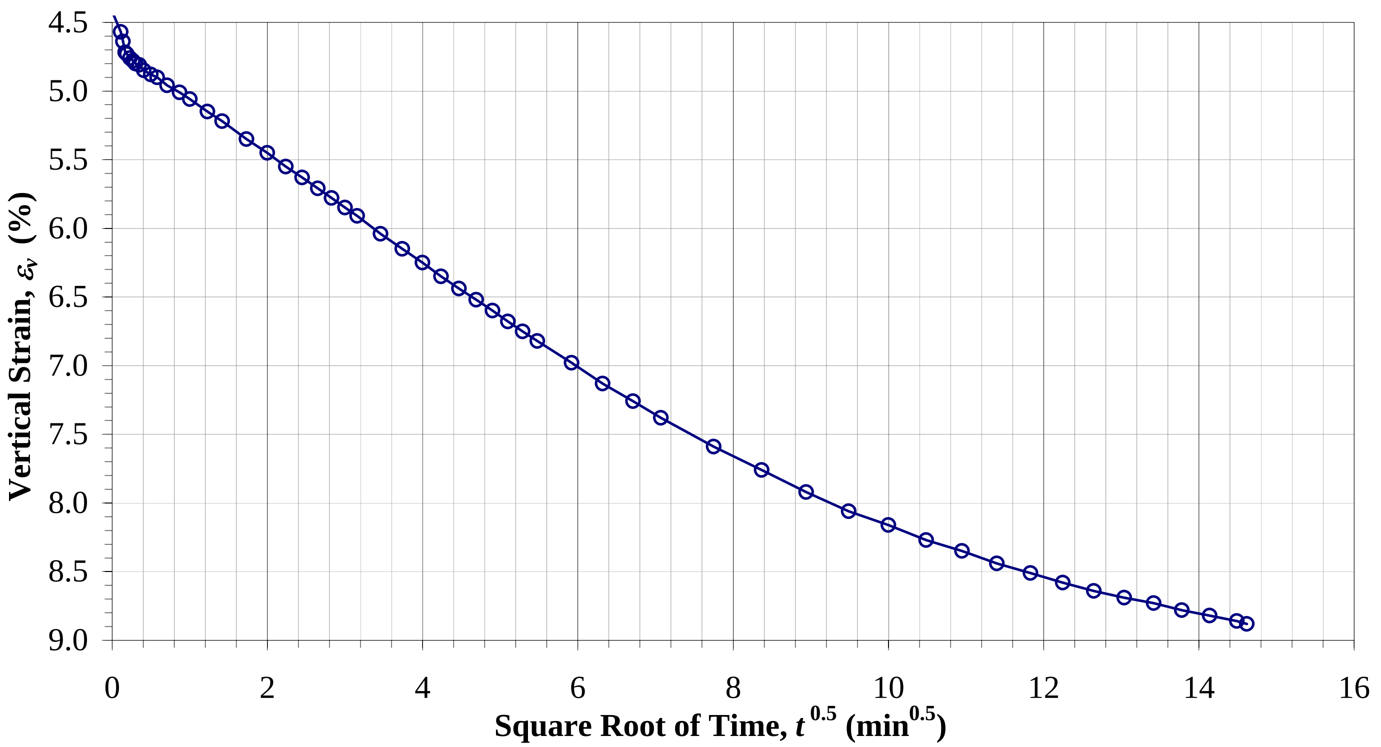
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-11
Sample:
Depth: 14.5'

Constant Load Step: 7 of 14
Stress: 6400 psf





One-Dimensional Consolidation Properties of Soils

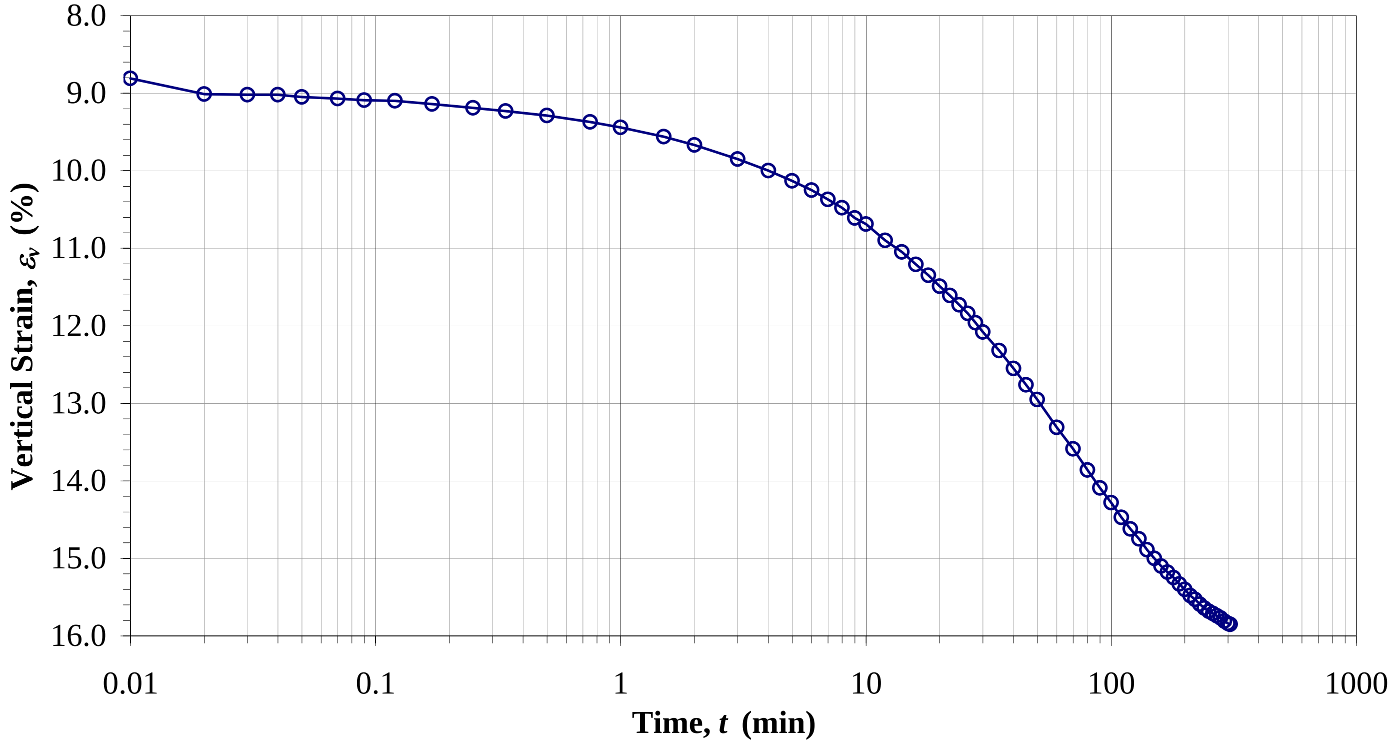
(ASTM D2435)

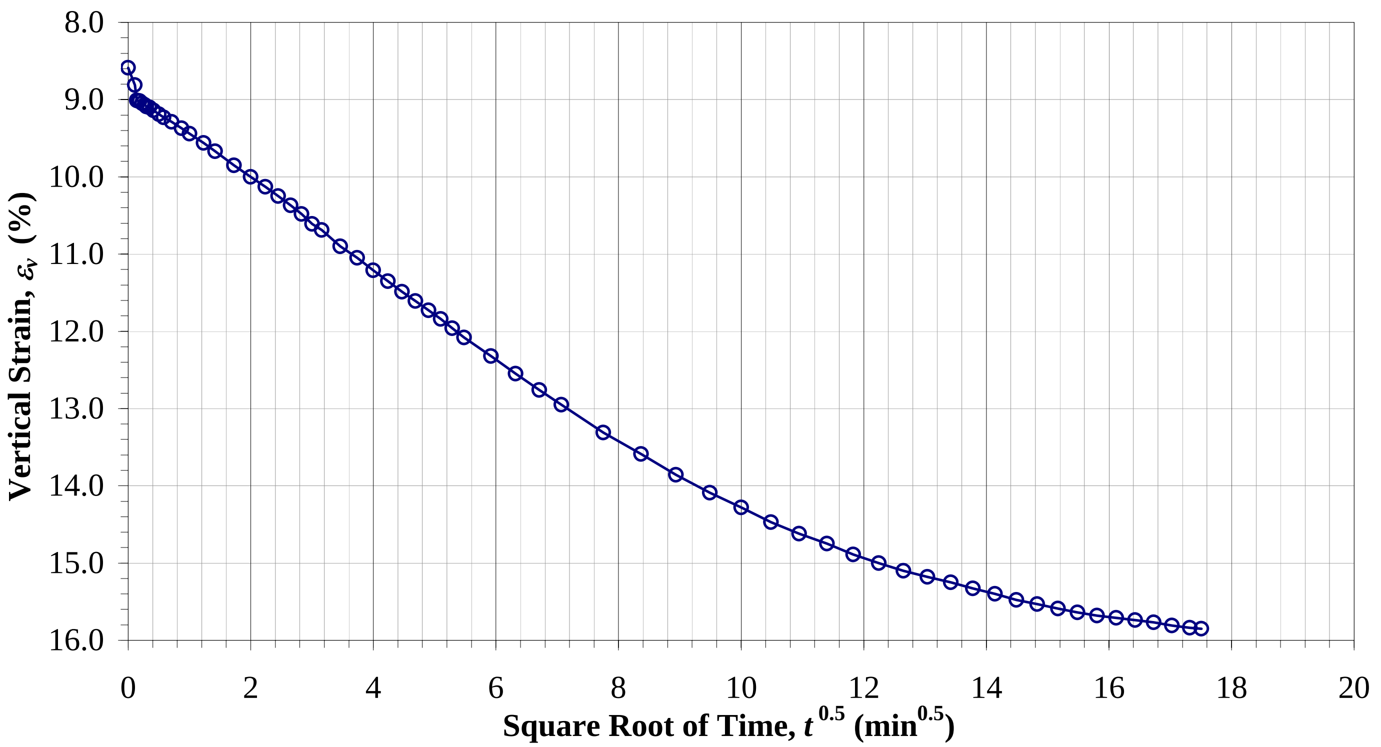
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-11
Sample:
Depth: 14.5'

Constant Load Step: 8 of 14

Stress: 12800 psf





One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

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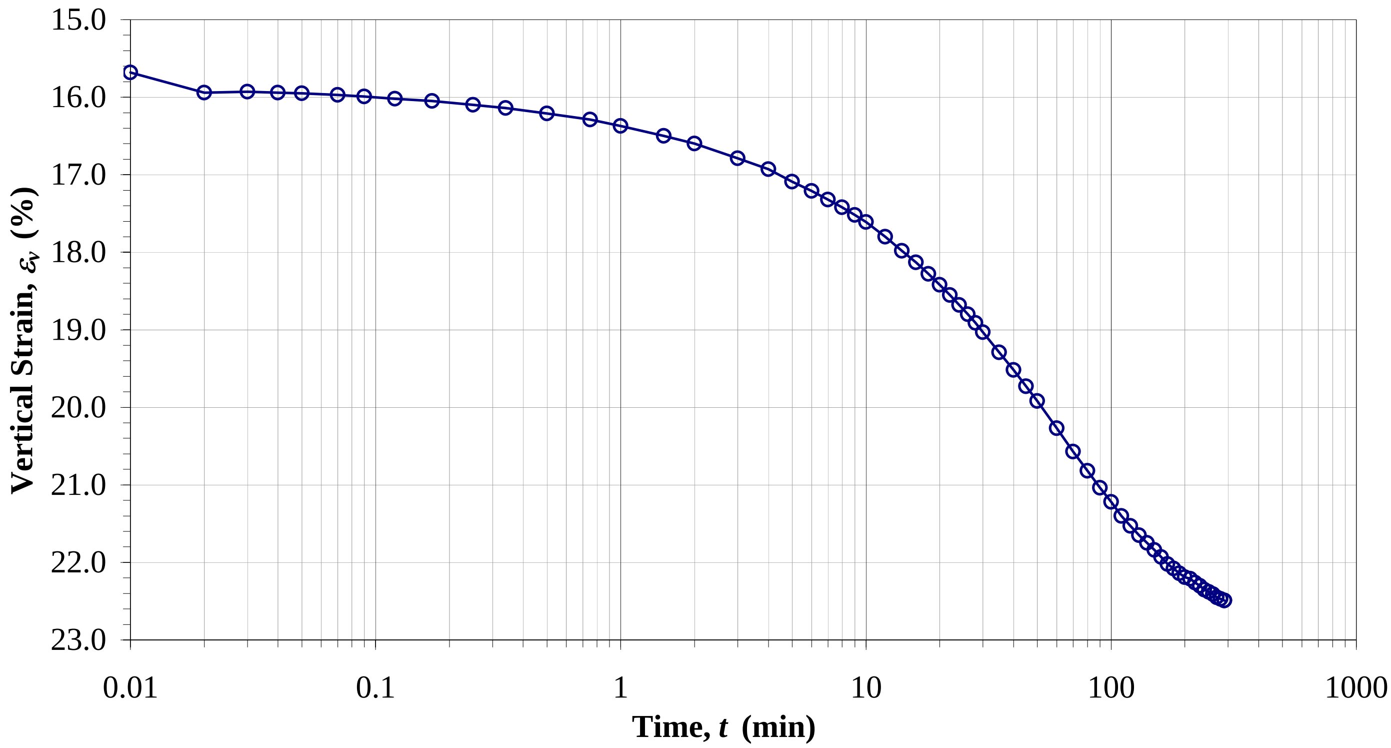
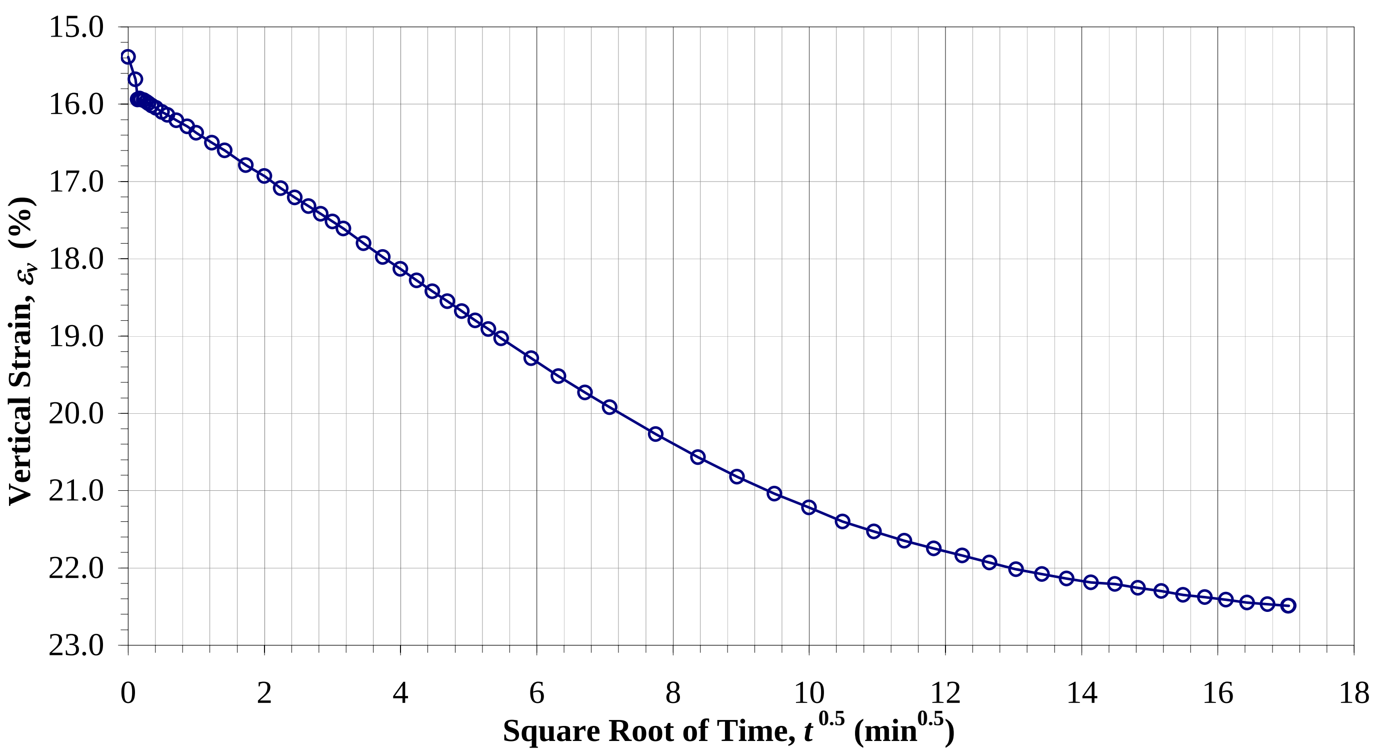
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-11
Sample:
Depth: 14.5'

Constant Load Step: 9 of 14
Stress: 25600 psf



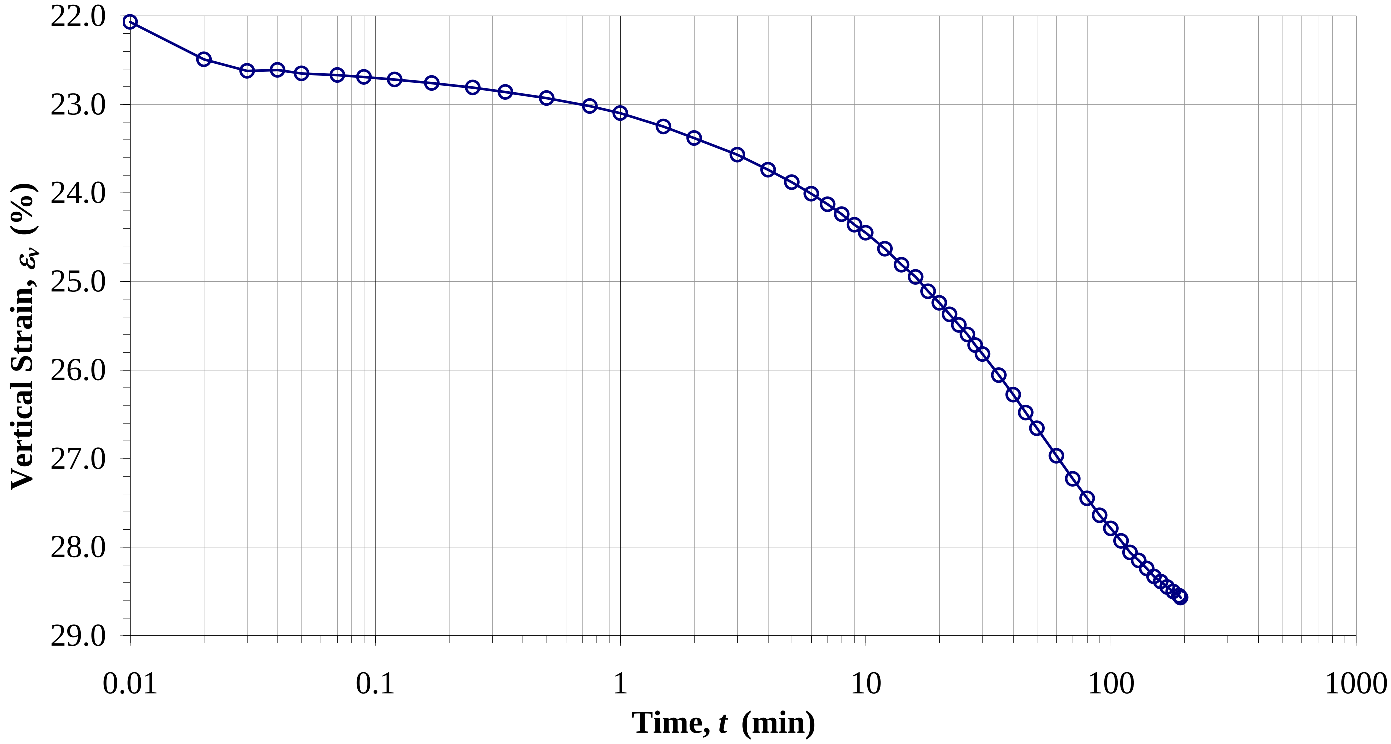


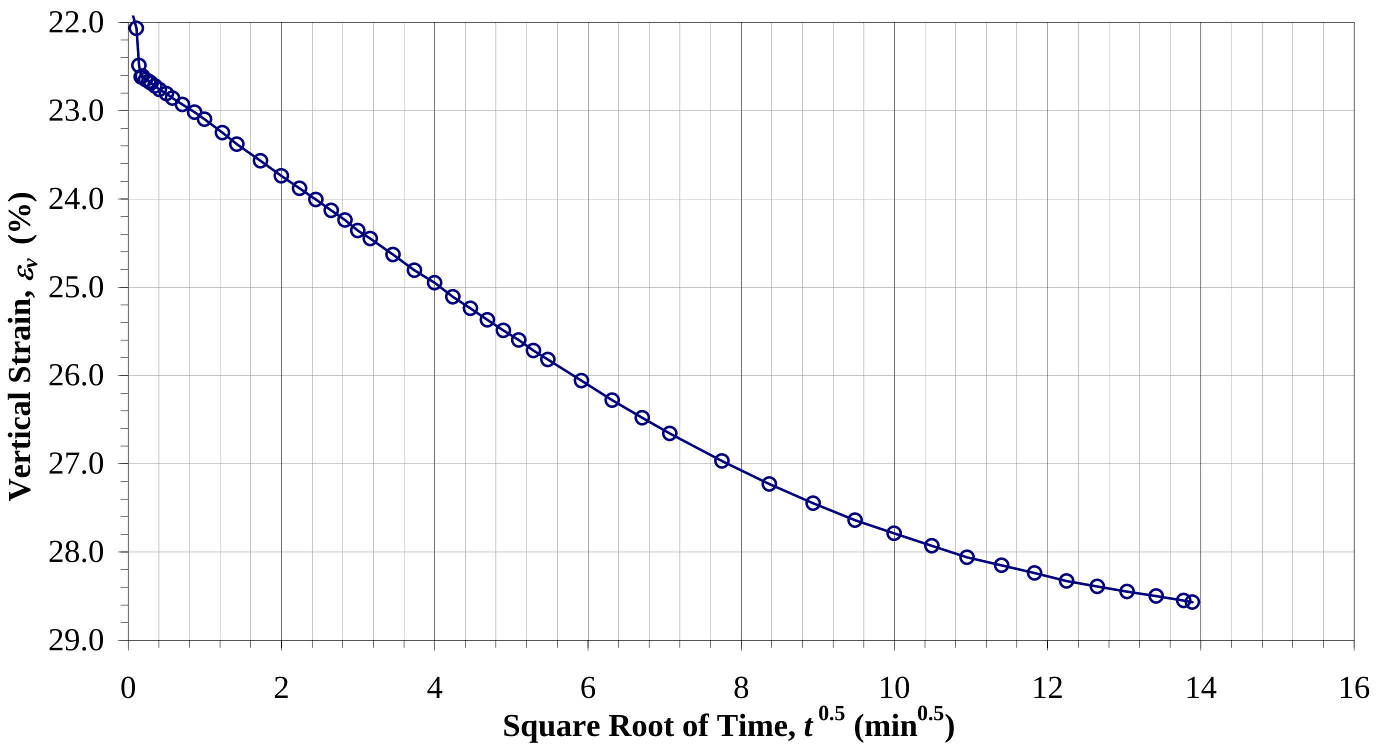
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-11
Sample:
Depth: 14.5'

Constant Load Step: 10 of 14
Stress: 51200 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

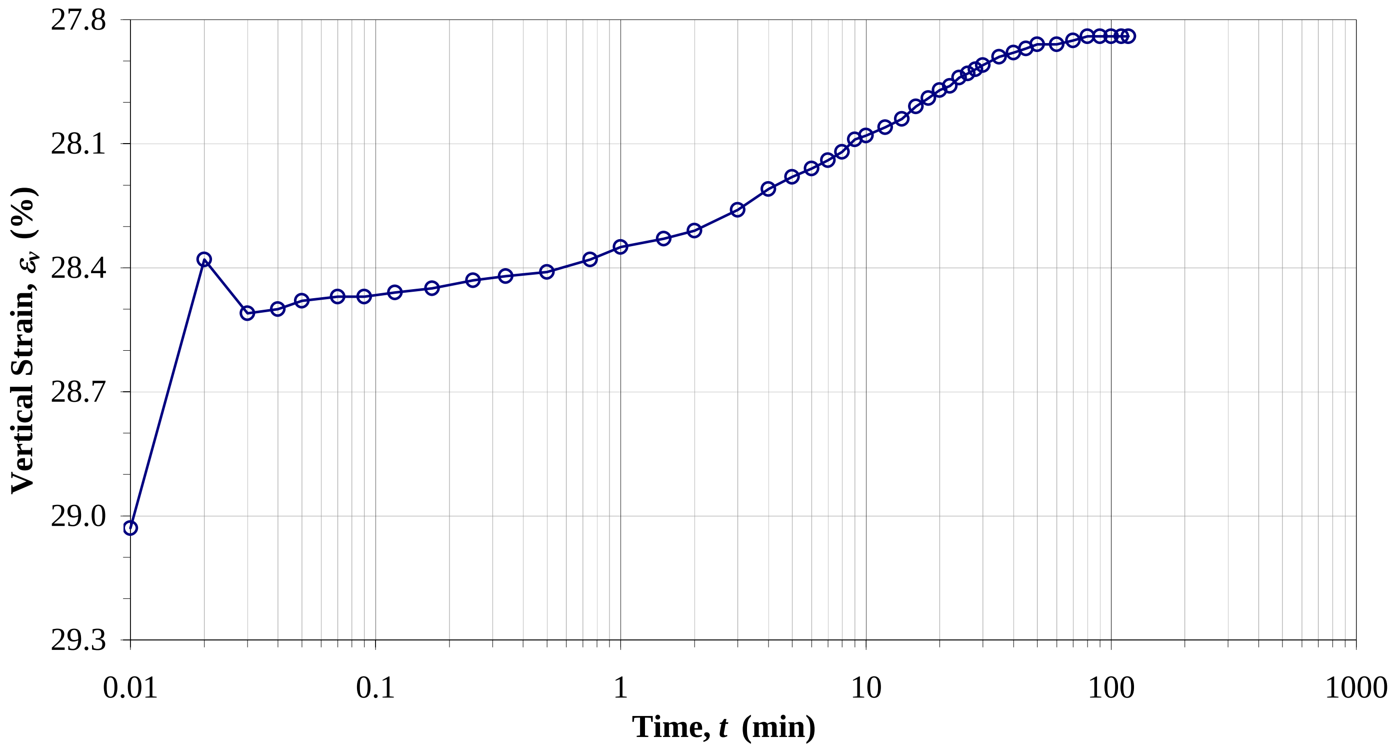
Project: **Logan WWTP** **Boring No.:** **B-11**

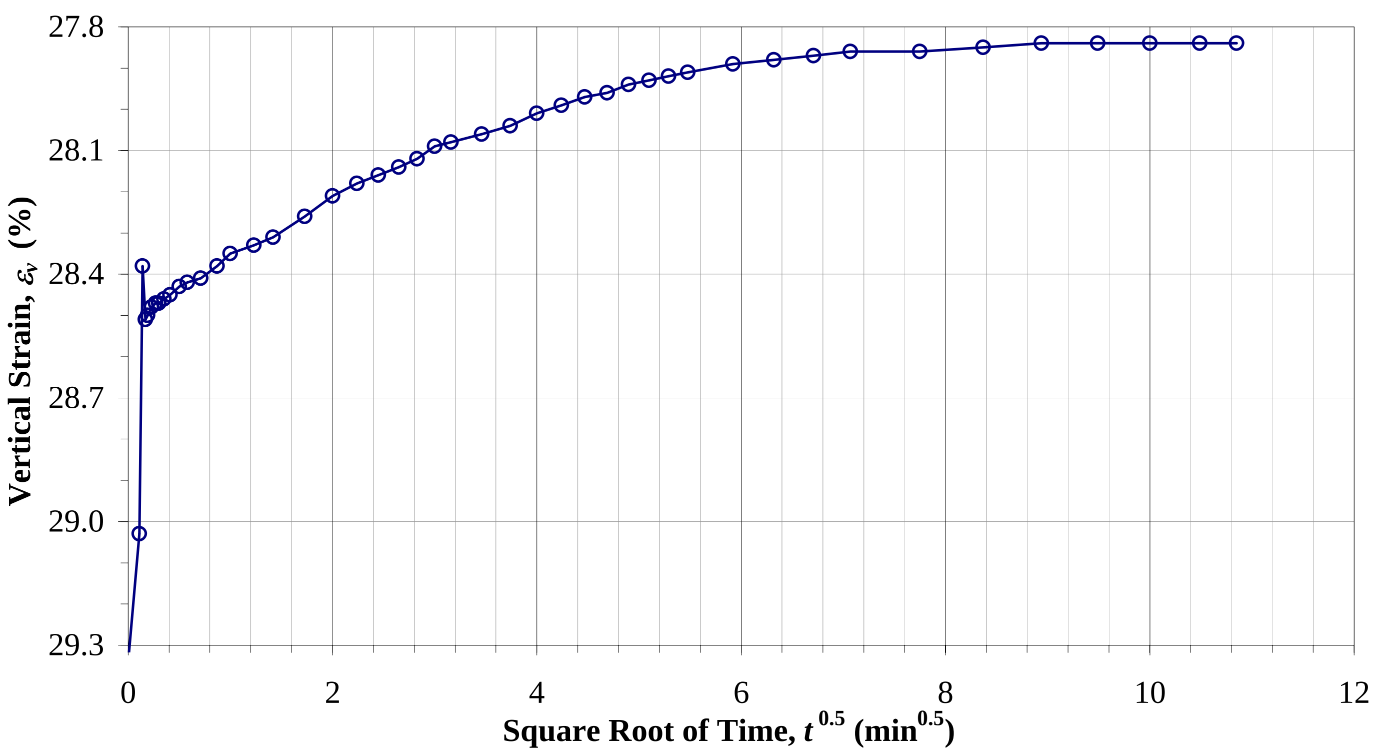
No: **00823-012** **Sample:**

Location: Logan, Utah **Depth:** **14.5'**

Constant Load Step: 11 of 14

Stress: 25600 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

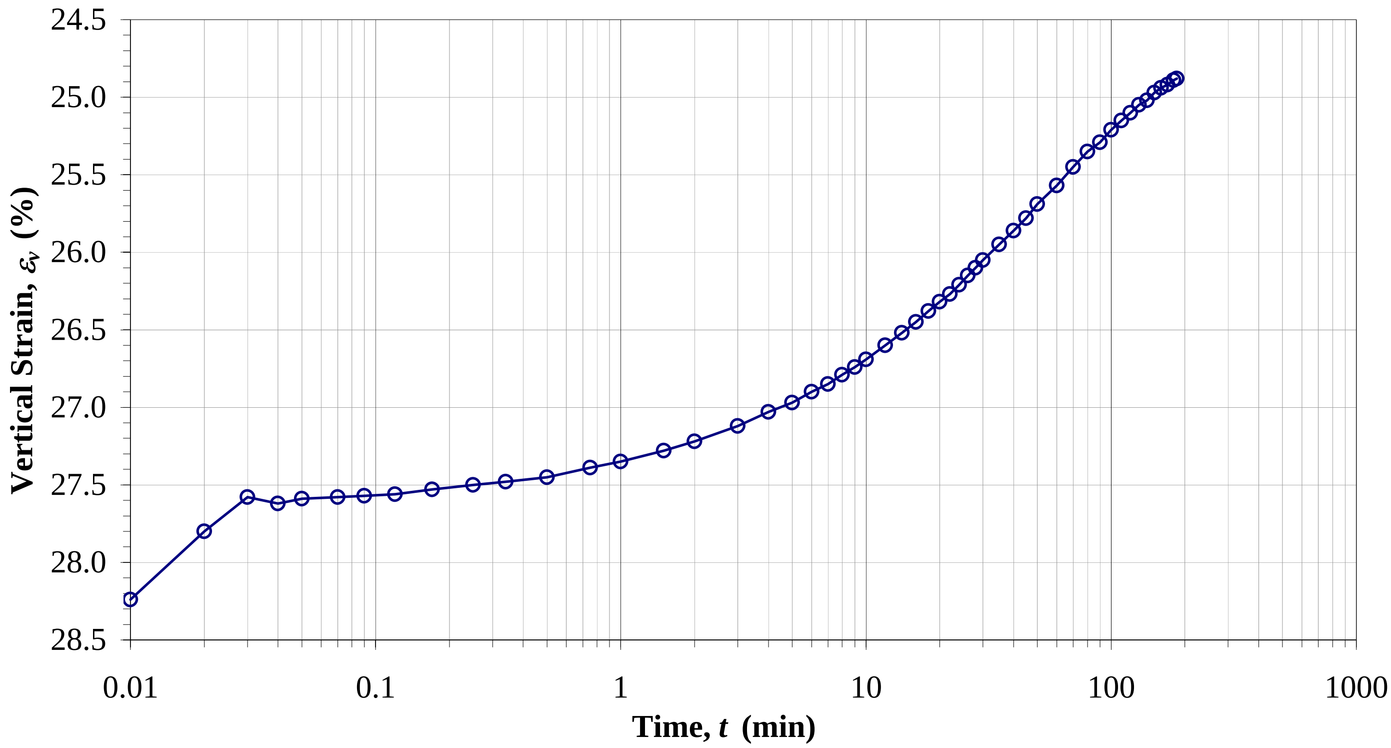
Project: Logan WWTP | **Boring No.:** B-11

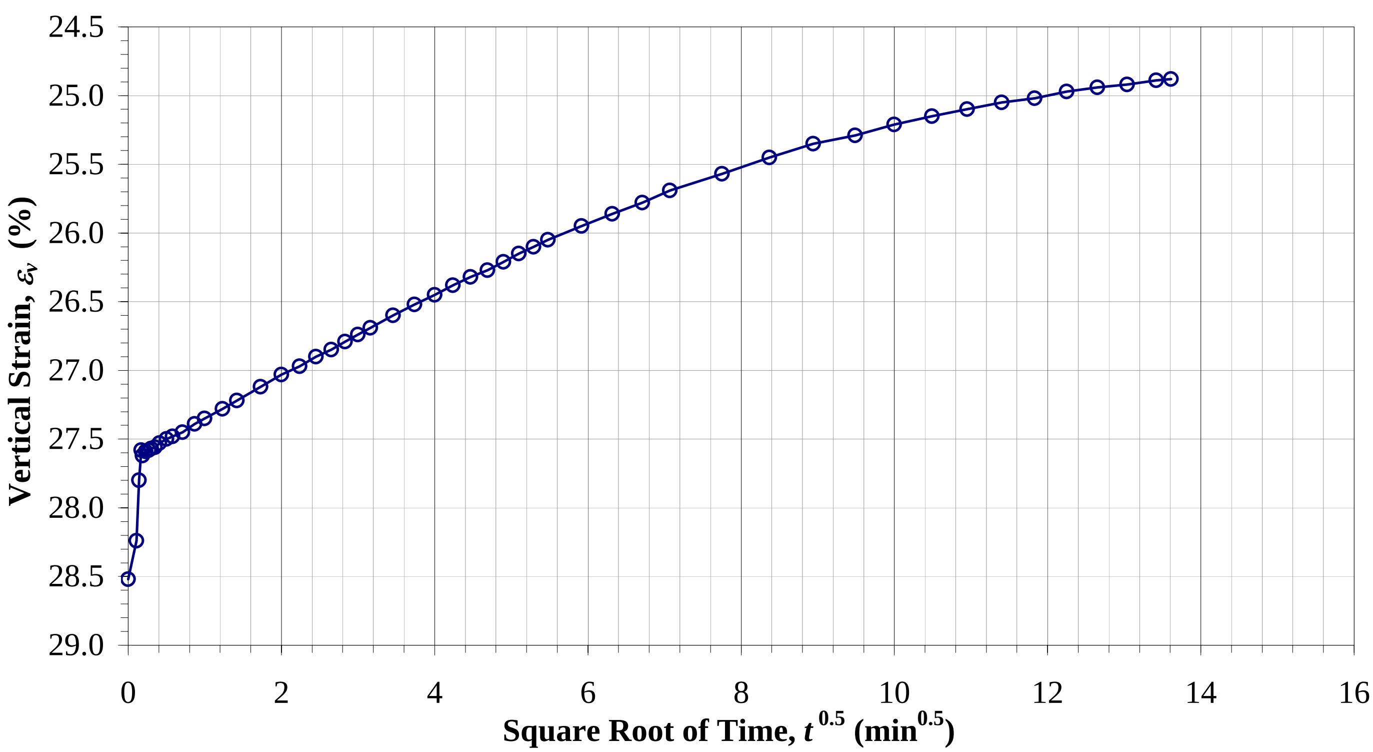
No: 00823-012 | **Sample:**

Location: Logan, Utah | **Depth:** 14.5'

Constant Load Step: 12 of 14

Stress: 6400 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

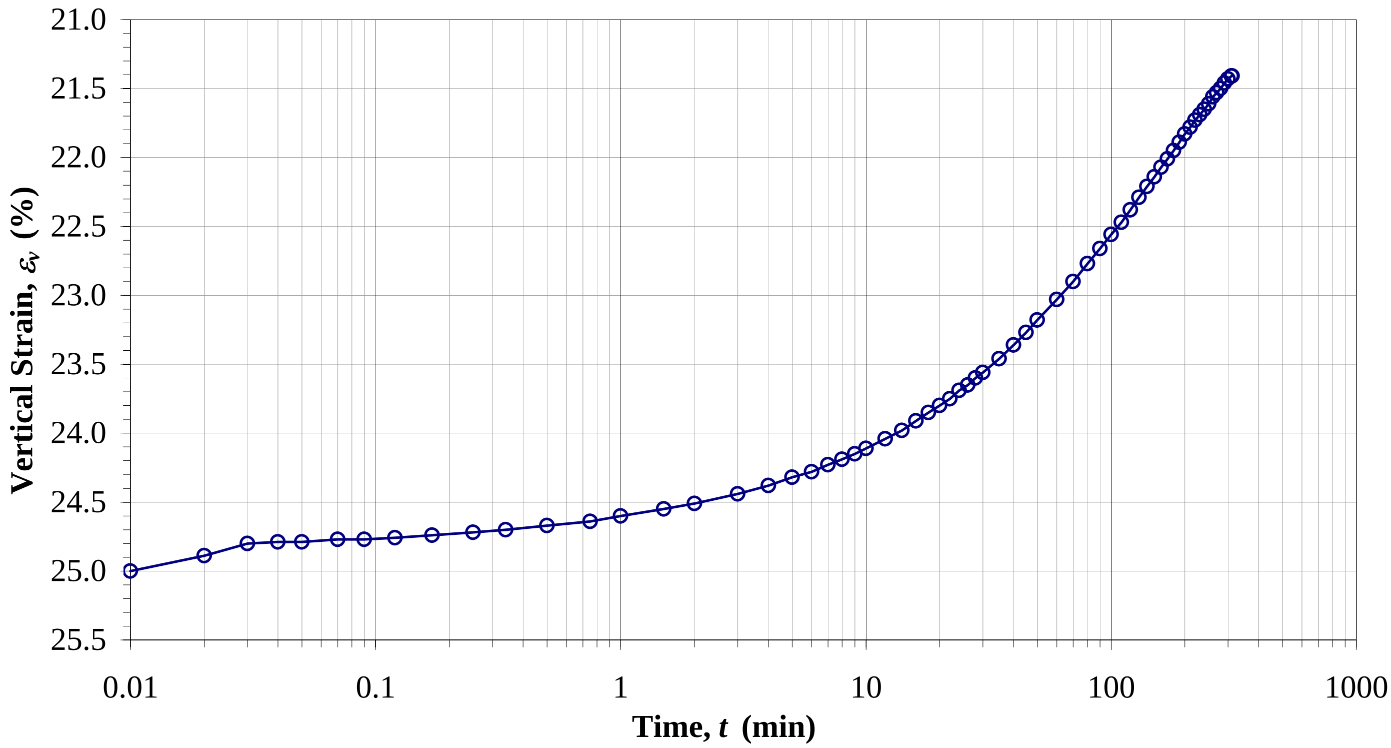
Project: **Logan WWTP** | **Boring No.:** **B-11**

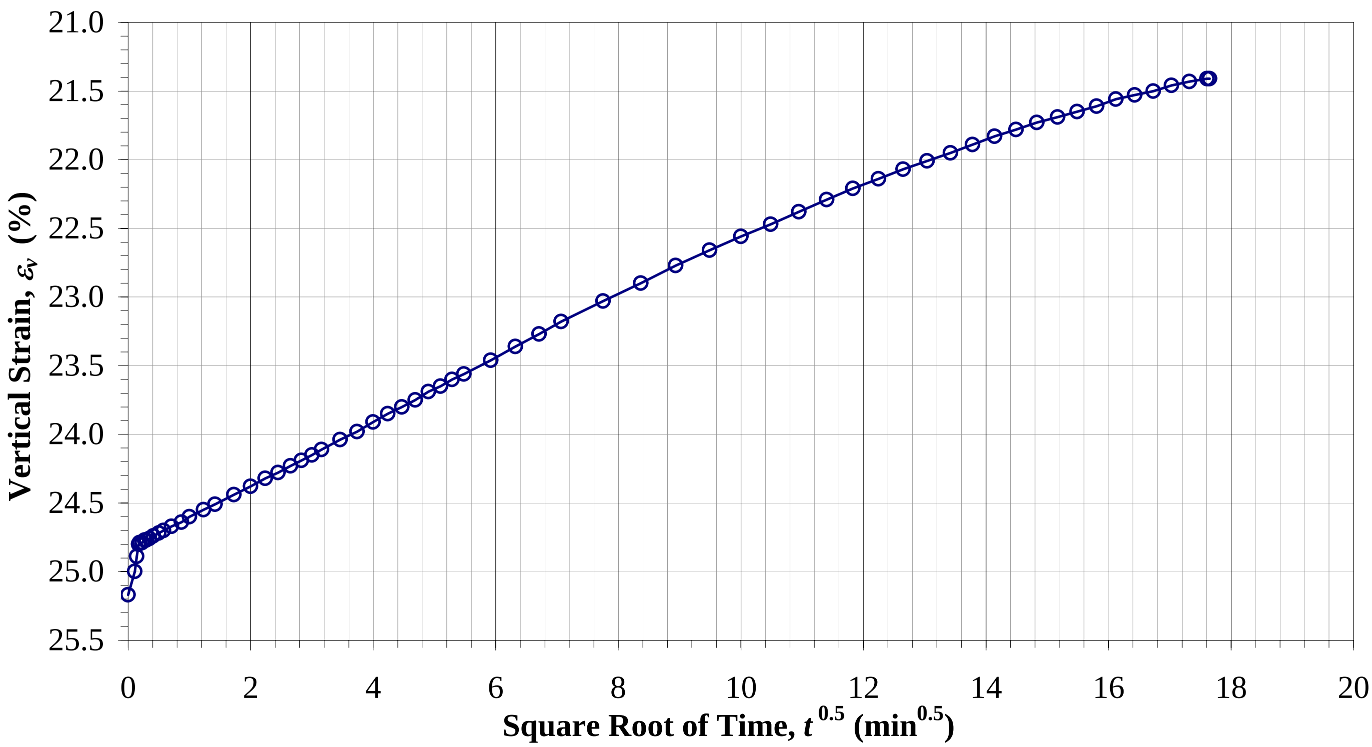
No: **00823-012** | **Sample:**

Location: Logan, Utah | **Depth:** **14.5'**

Constant Load Step: 13 of 14

Stress: 1600 psf





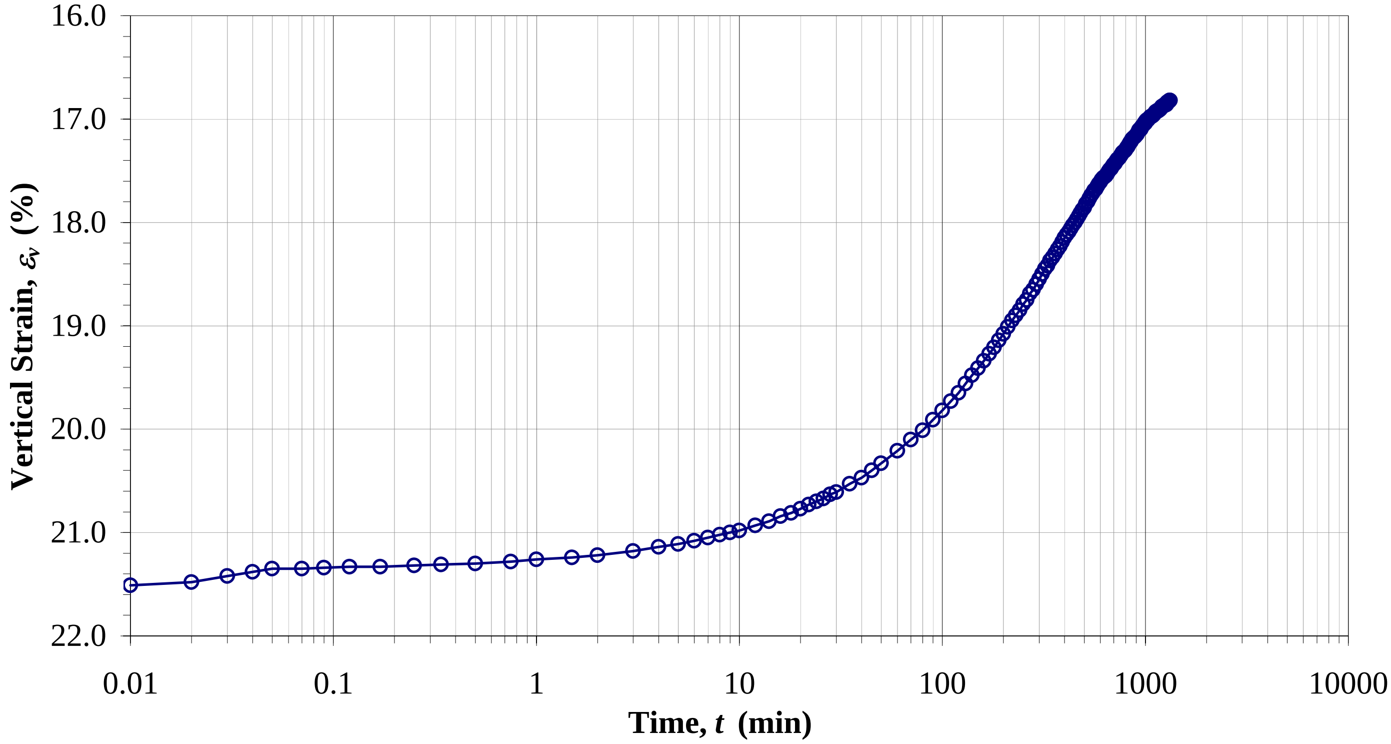
One-Dimensional Consolidation Properties of Soils

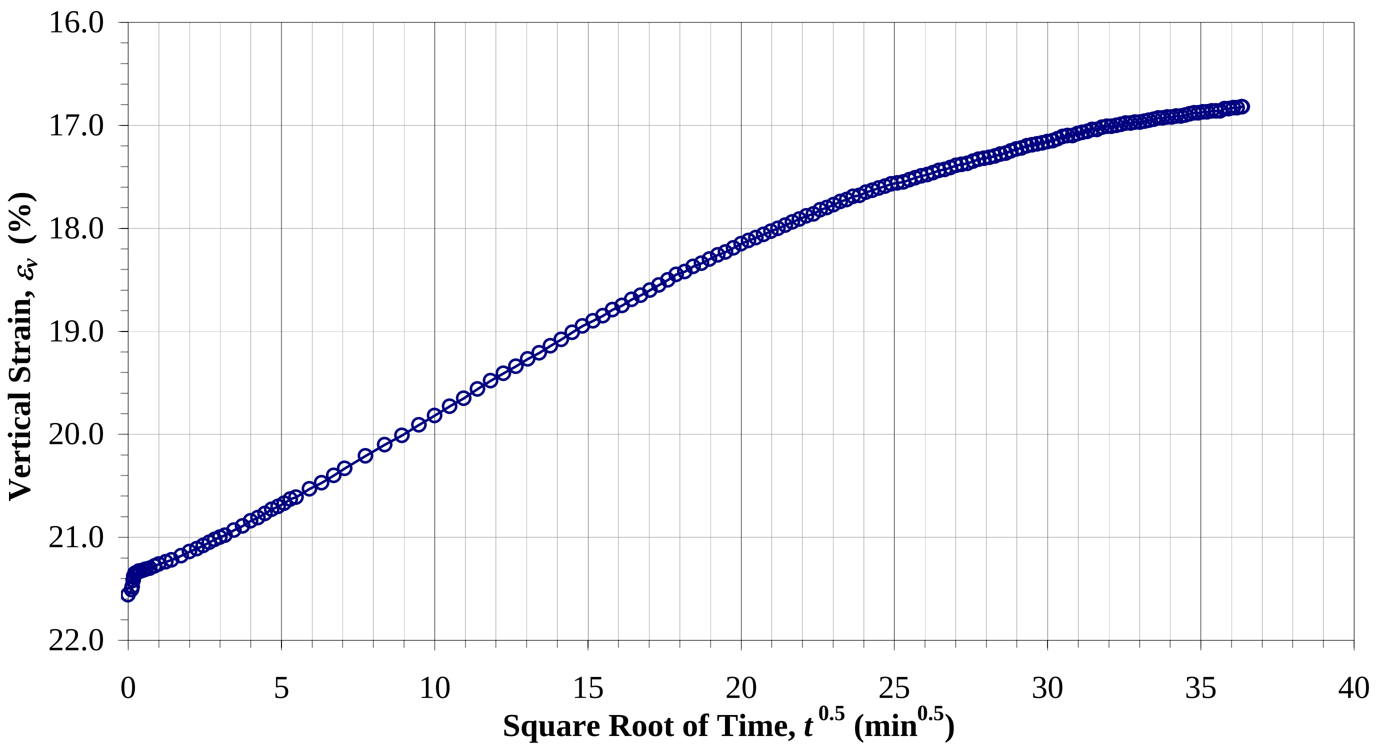
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-11
Sample:
Depth: 14.5'

Constant Load Step: 14 of 14
Stress: 400 psf





One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/25/2013
By: MP

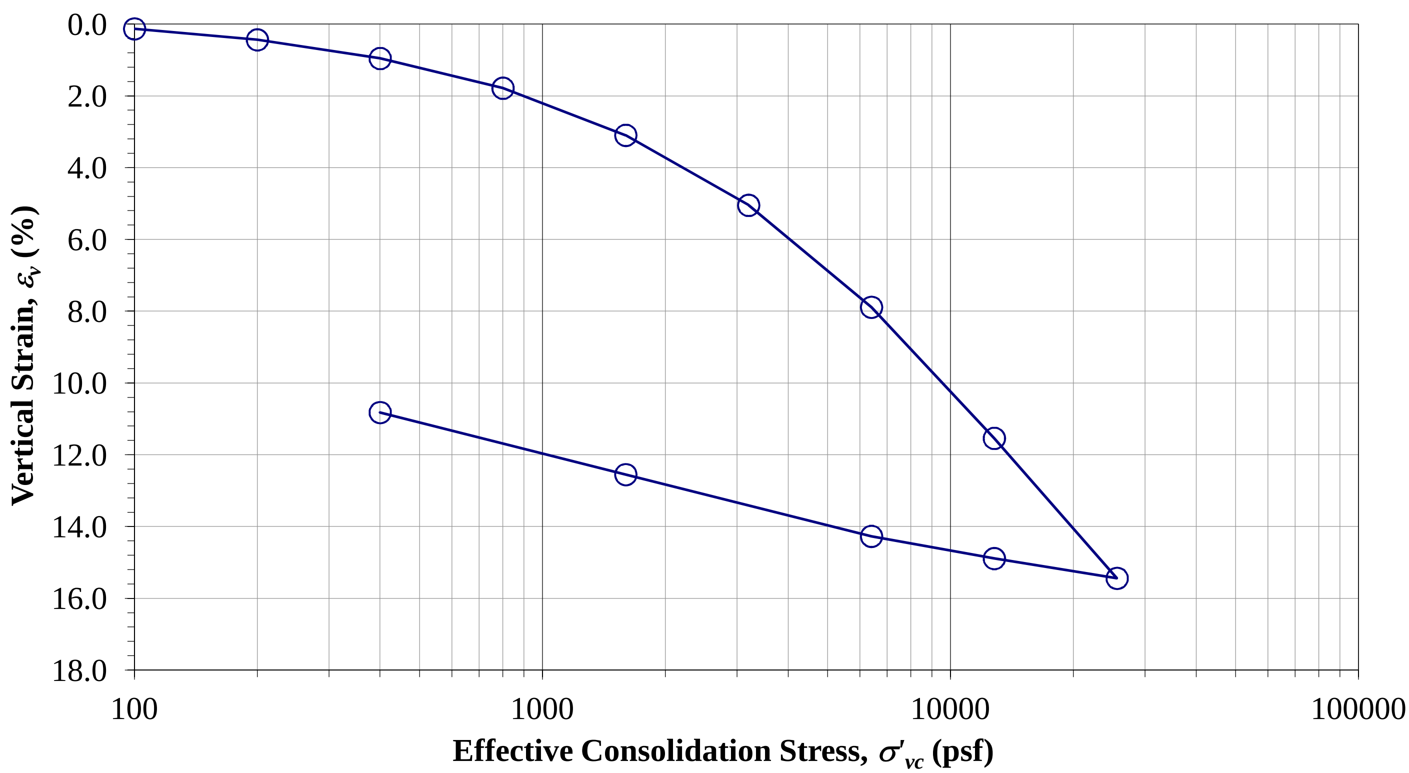
Boring No.: B-12
Sample:
Depth: 24.5'
Sample Description: Grey clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from Shelby tube

Test method:	B	
Inundation stress (psf), timing:	Seating	Beginning
Specific gravity, G_s	2.67	Assumed

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.8918
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	186.03	182.30
Wt. rings/tare (g)	42.65	42.65
Total unit wt., γ (pcf)	119.1	130.1
Wet soil + tare (g)	457.71	
Dry soil + tare (g)	378.14	
Tare (g)	126.12	
Water content, ω (%)	31.6	28.2
Dry unit wt., γ_d (pcf)	90.6	101.5
Saturation, S	1.00	1.00

*Note: C_v, C_c, C_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0000	0.00	1.0000	0.8407
100	0.0013	0.13	0.9987	0.8383
200	0.0044	0.44	0.9956	0.8326
400	0.0096	0.96	0.9904	0.8231
800	0.0179	1.79	0.9822	0.8078
1600	0.0310	3.10	0.9690	0.7837
3200	0.0505	5.05	0.9495	0.7477
6400	0.0789	7.89	0.9211	0.6955
12800	0.1154	11.54	0.8846	0.6282
25600	0.1544	15.44	0.8456	0.5565
12800	0.1489	14.89	0.8511	0.5666
6400	0.1427	14.27	0.8573	0.5780
1600	0.1255	12.55	0.8745	0.6097
400	0.1082	10.82	0.8918	0.6415



Entered: ________
Reviewed: ________

One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP

No: 00823-012

Location: Logan, Utah

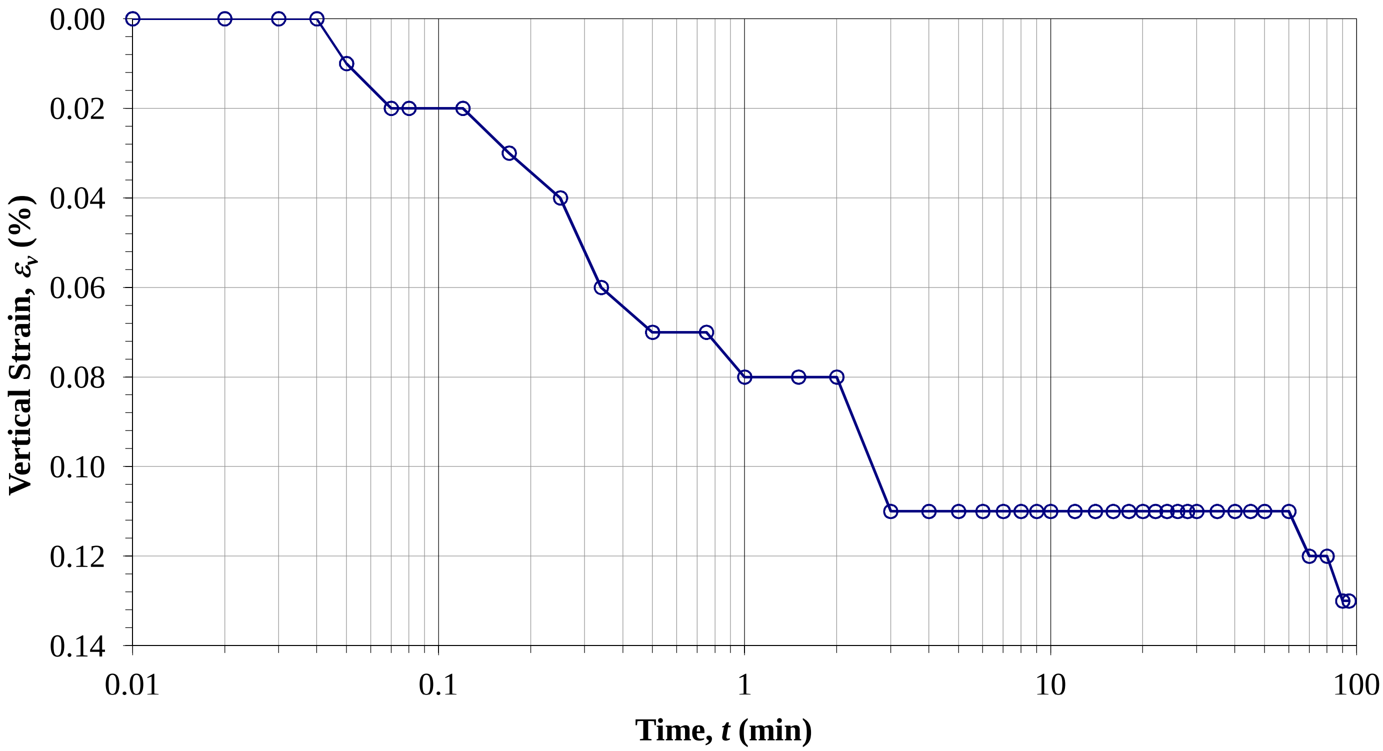
Boring No.: B-12

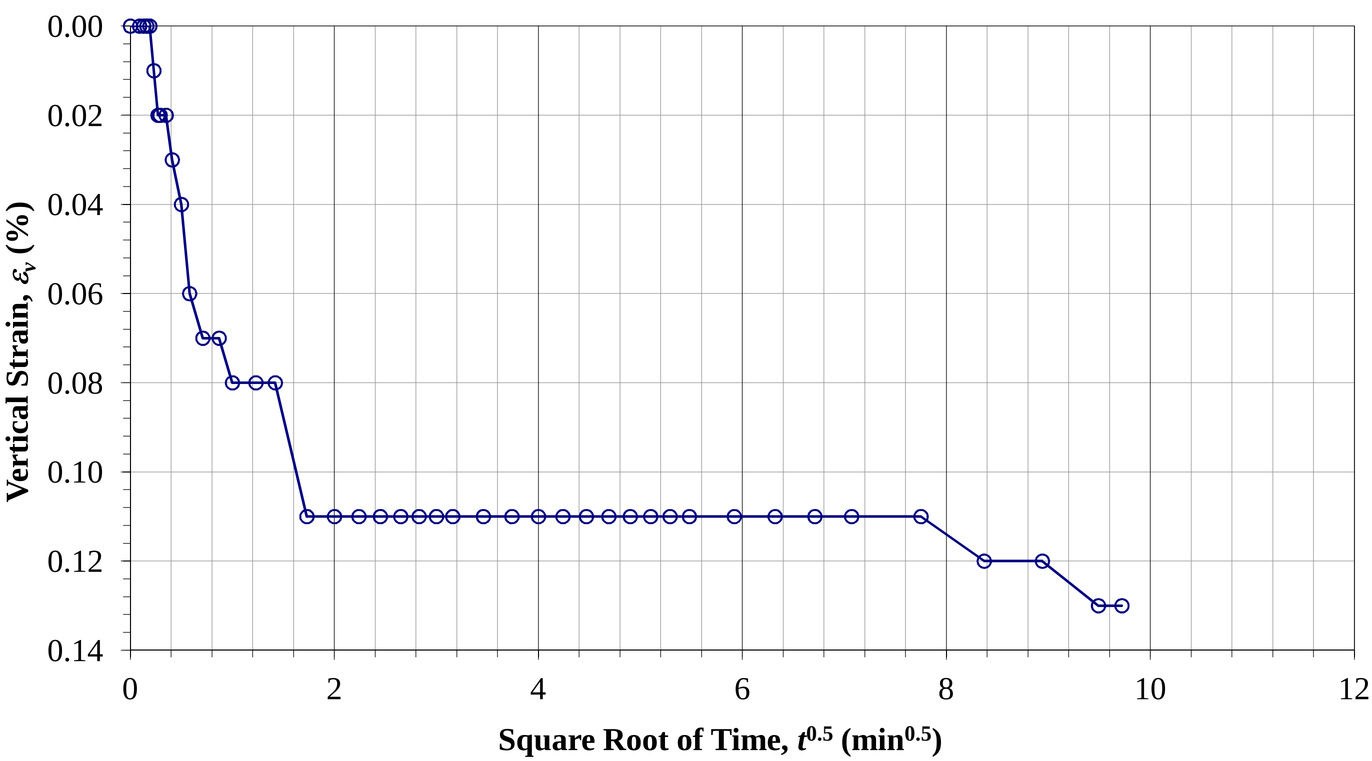
Sample:

Depth: 24.5'

Constant Load Step: 1 of 13

Stress: 100 psf



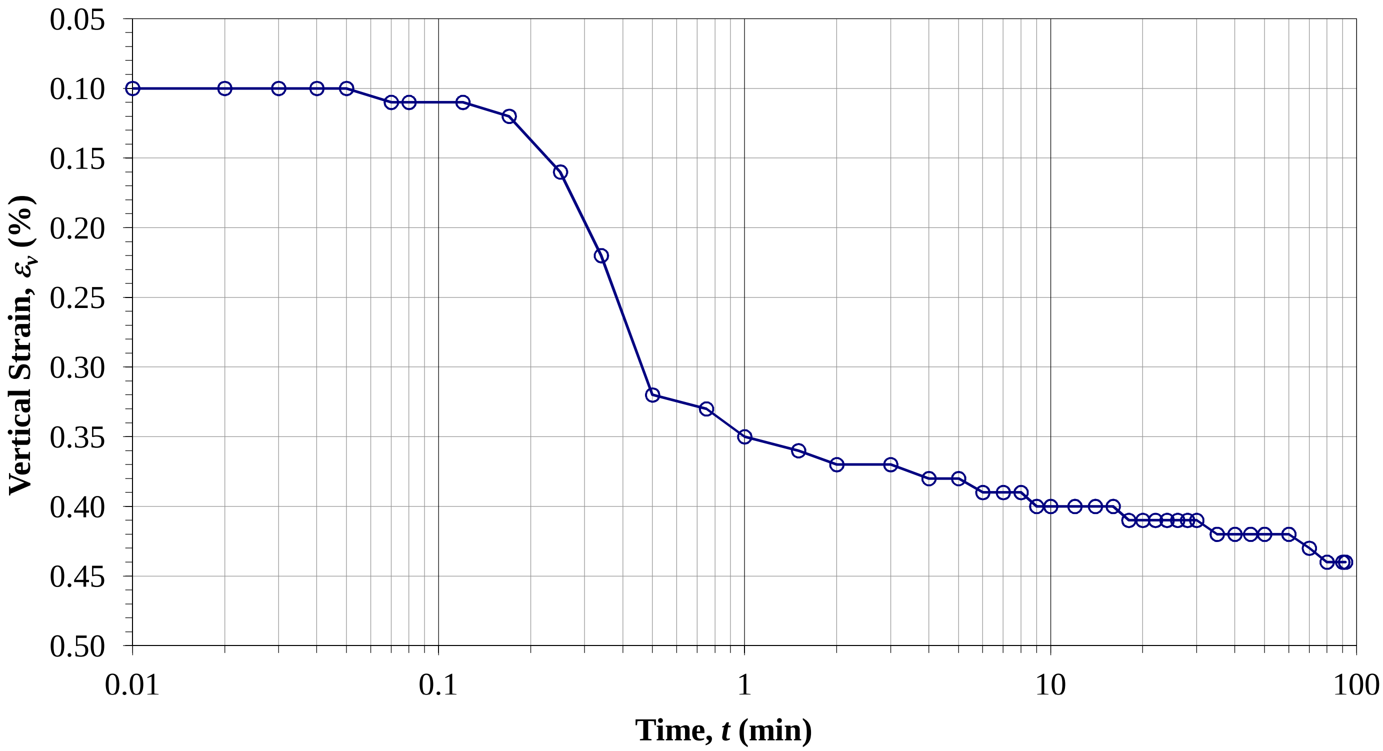


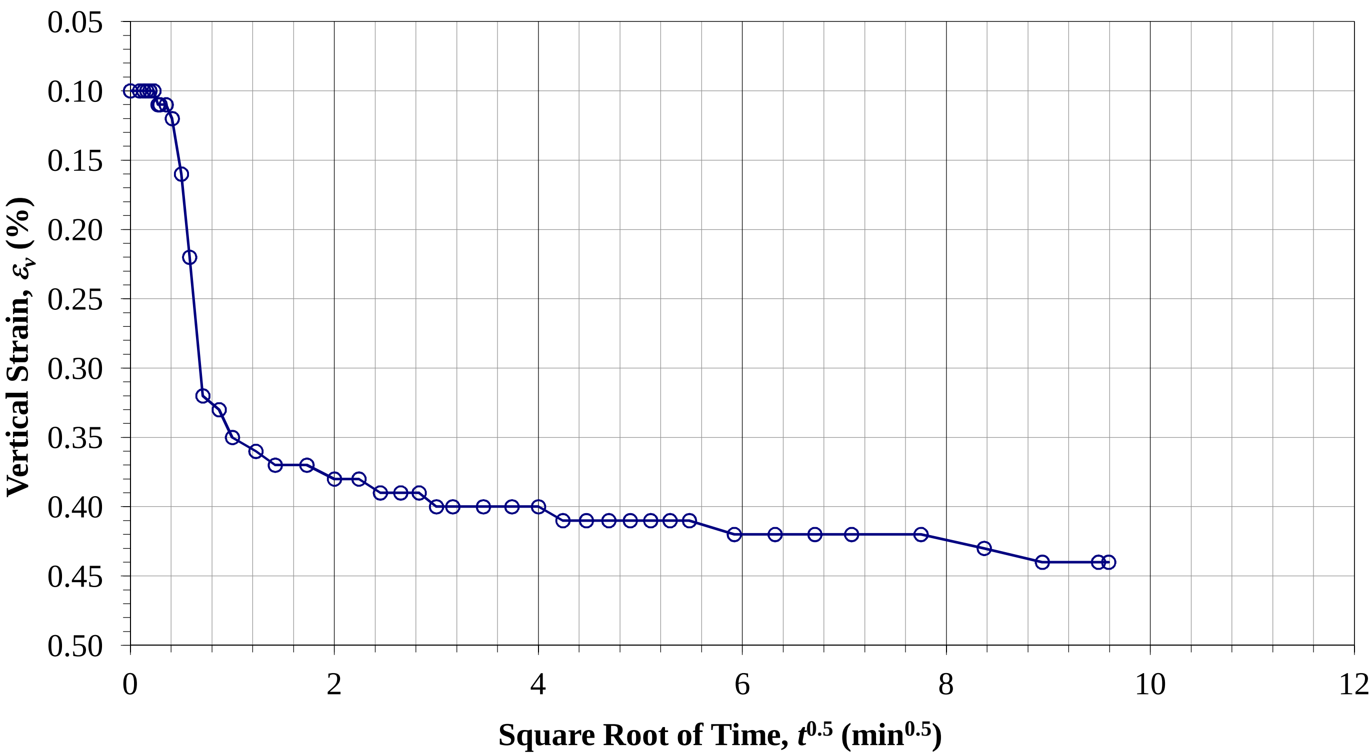
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-12
Sample:
Depth: 24.5'

Constant Load Step: 2 of 13
Stress: 200 psf



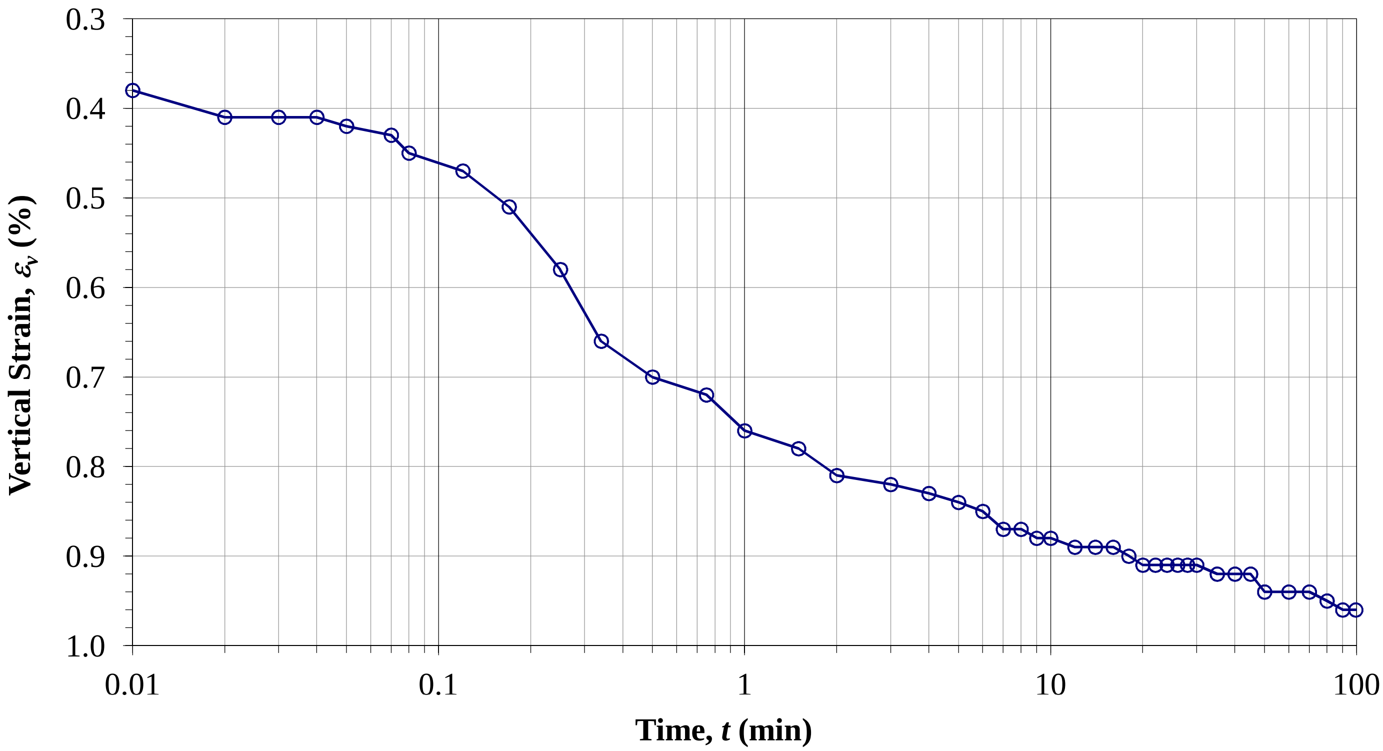


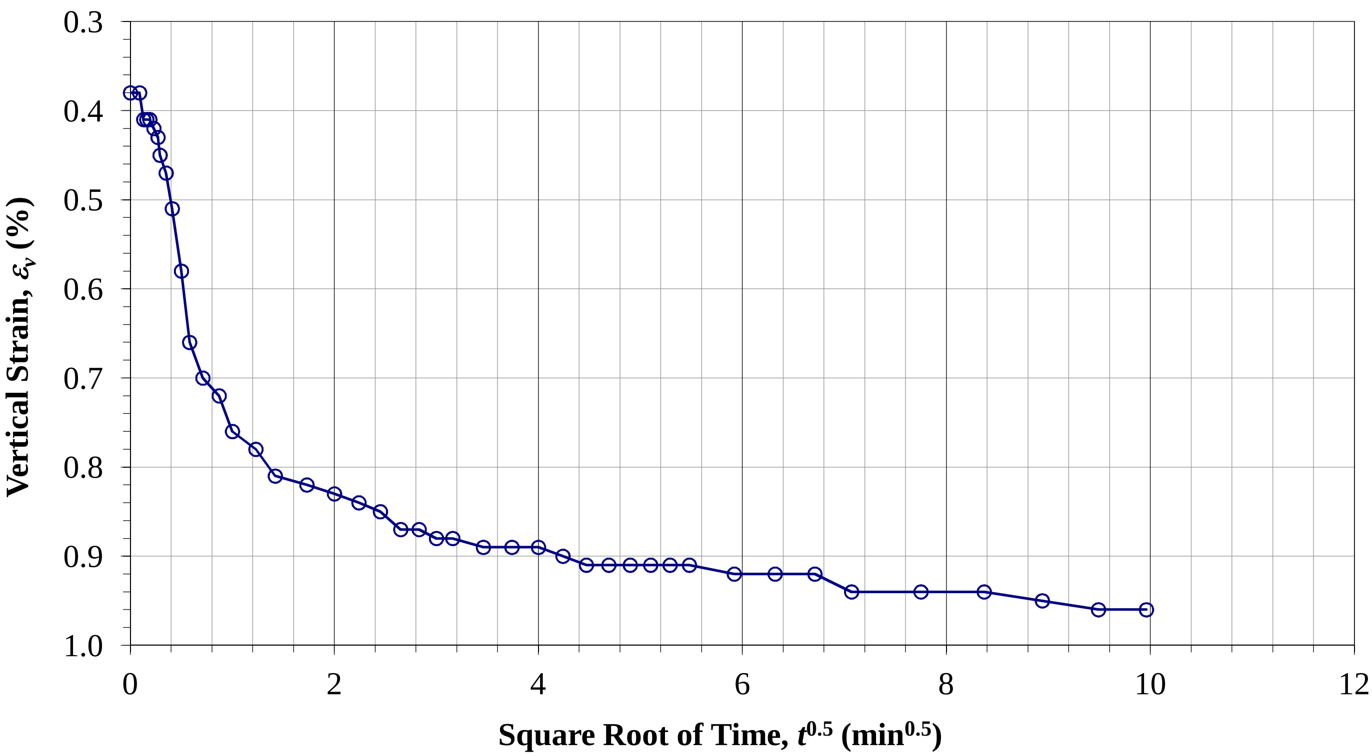
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-12
Sample:
Depth: 24.5'

Constant Load Step: 3 of 13
Stress: 400 psf





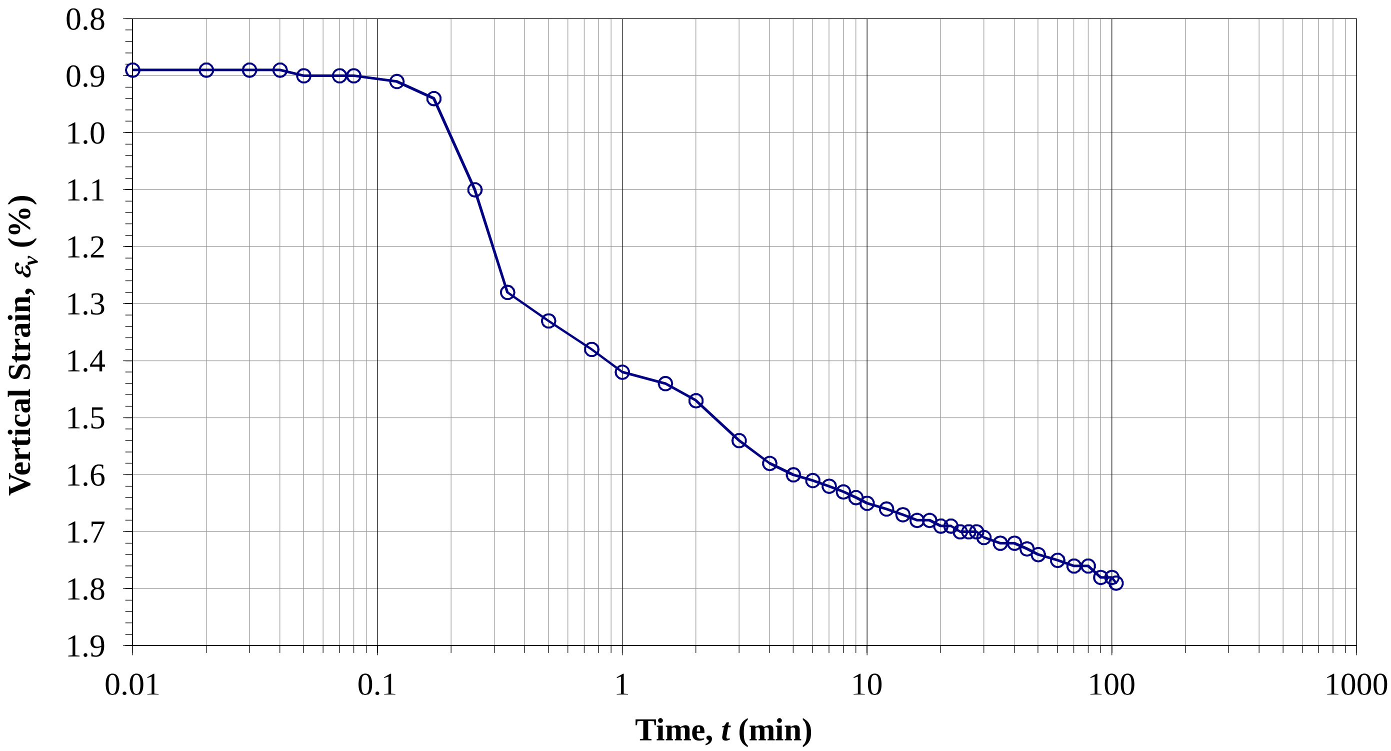
One-Dimensional Consolidation Properties of Soils

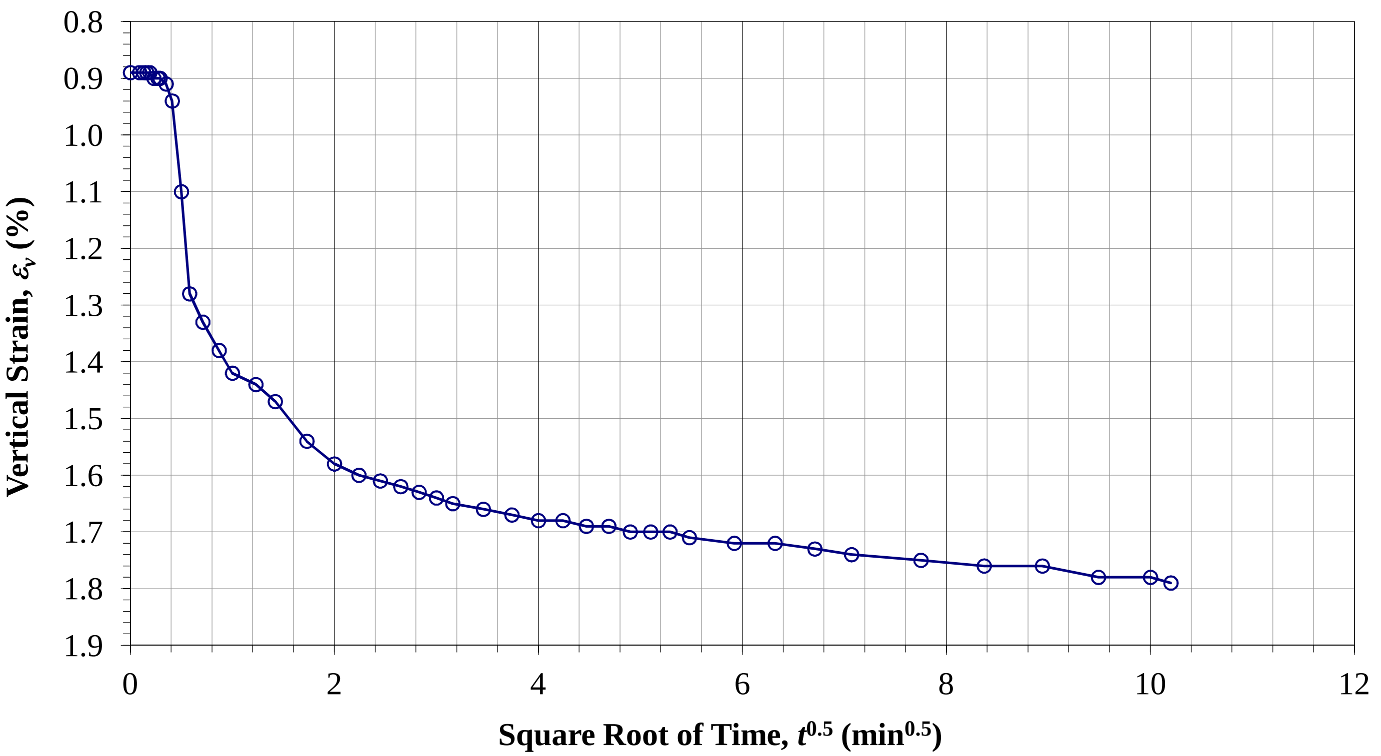
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-12
Sample:
Depth: 24.5'

Constant Load Step: 4 of 13
Stress: 800 psf





One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

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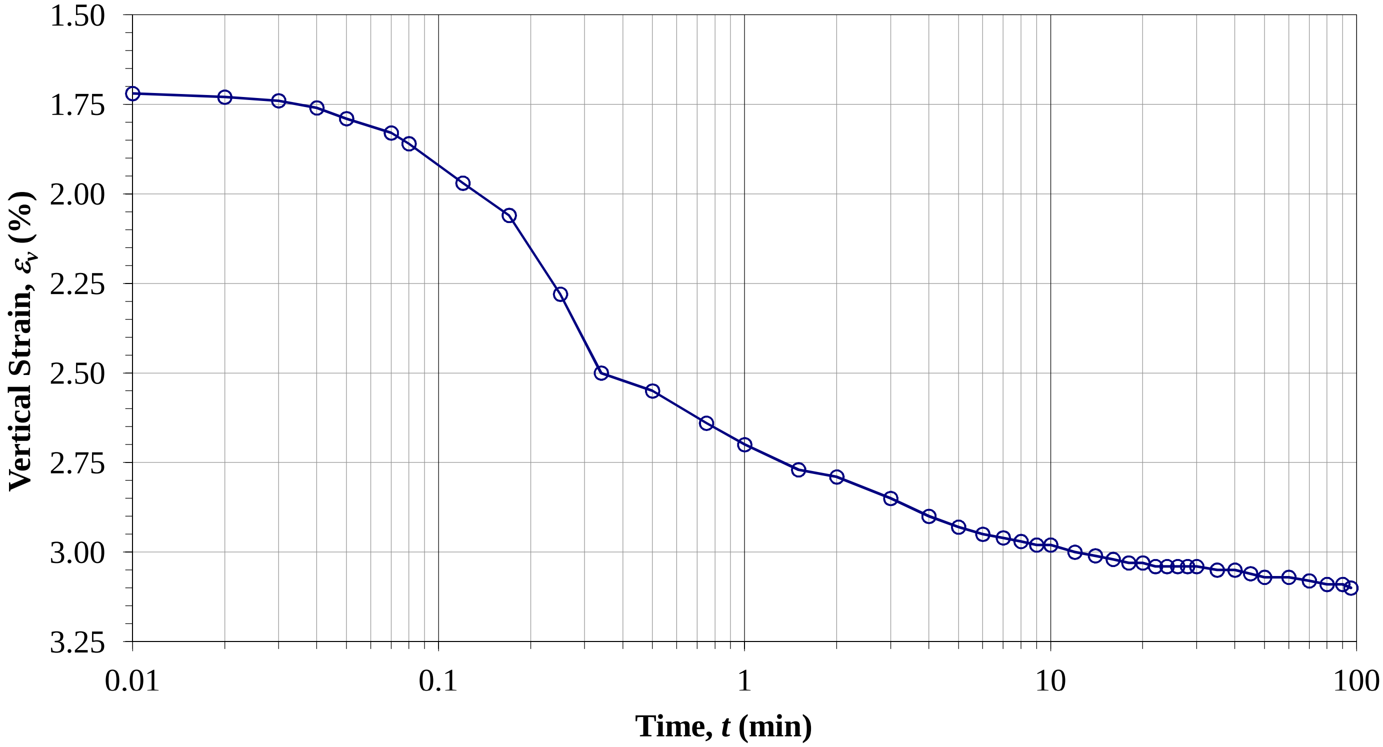
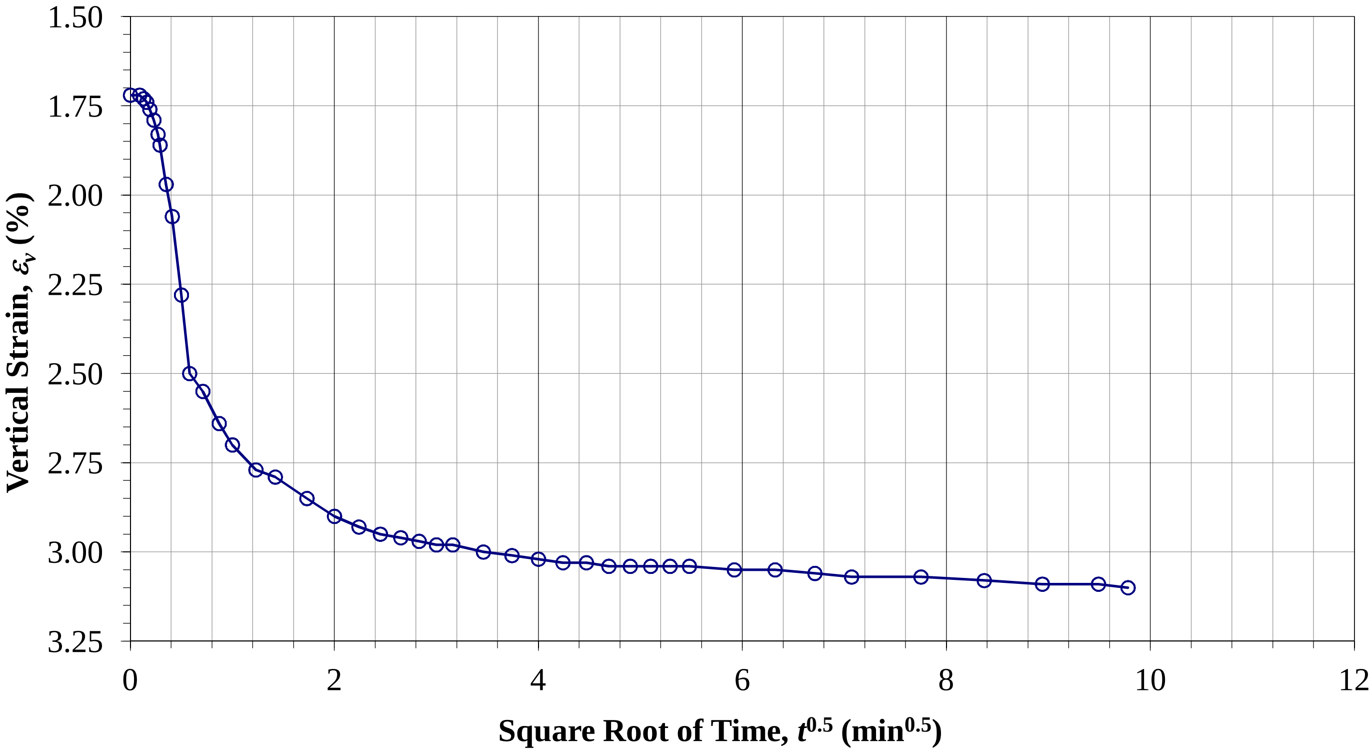
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-12
Sample:
Depth: 24.5'

Constant Load Step: 5 of 13
Stress: 1600 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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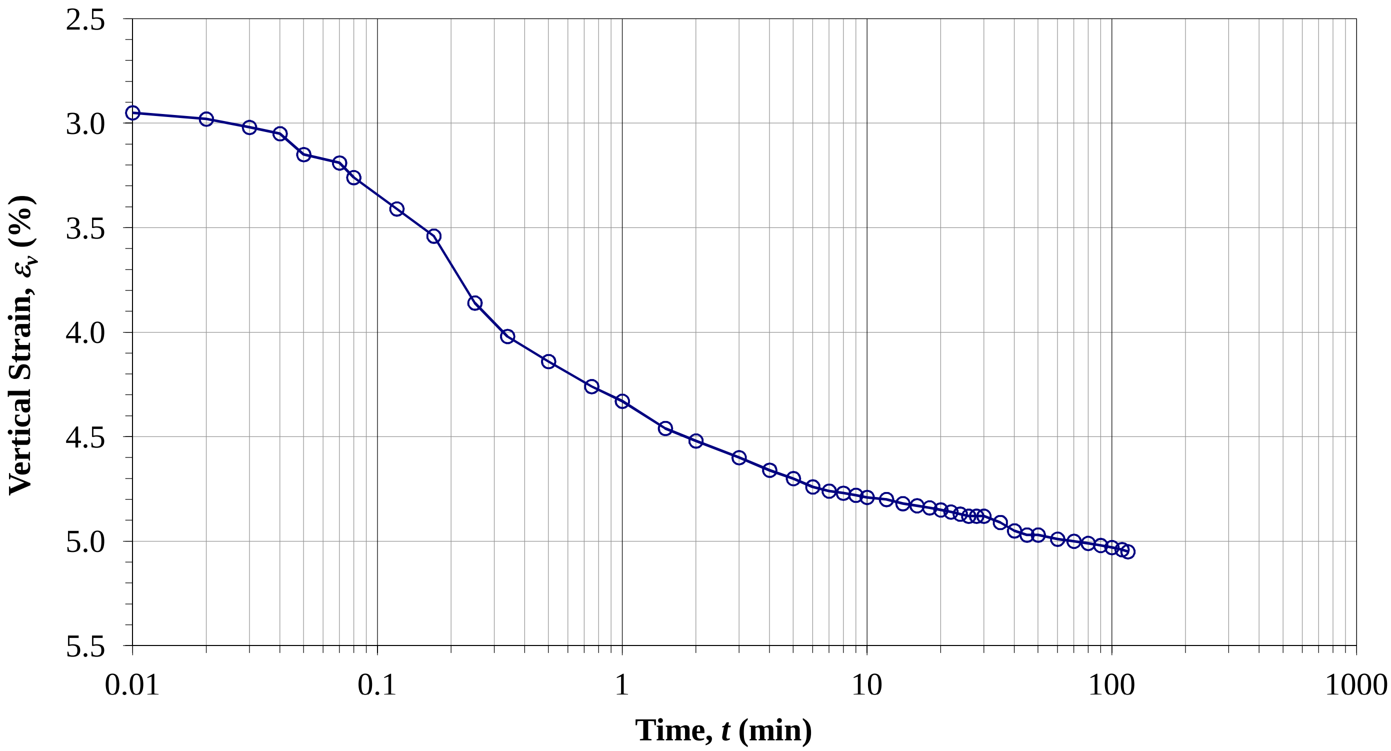
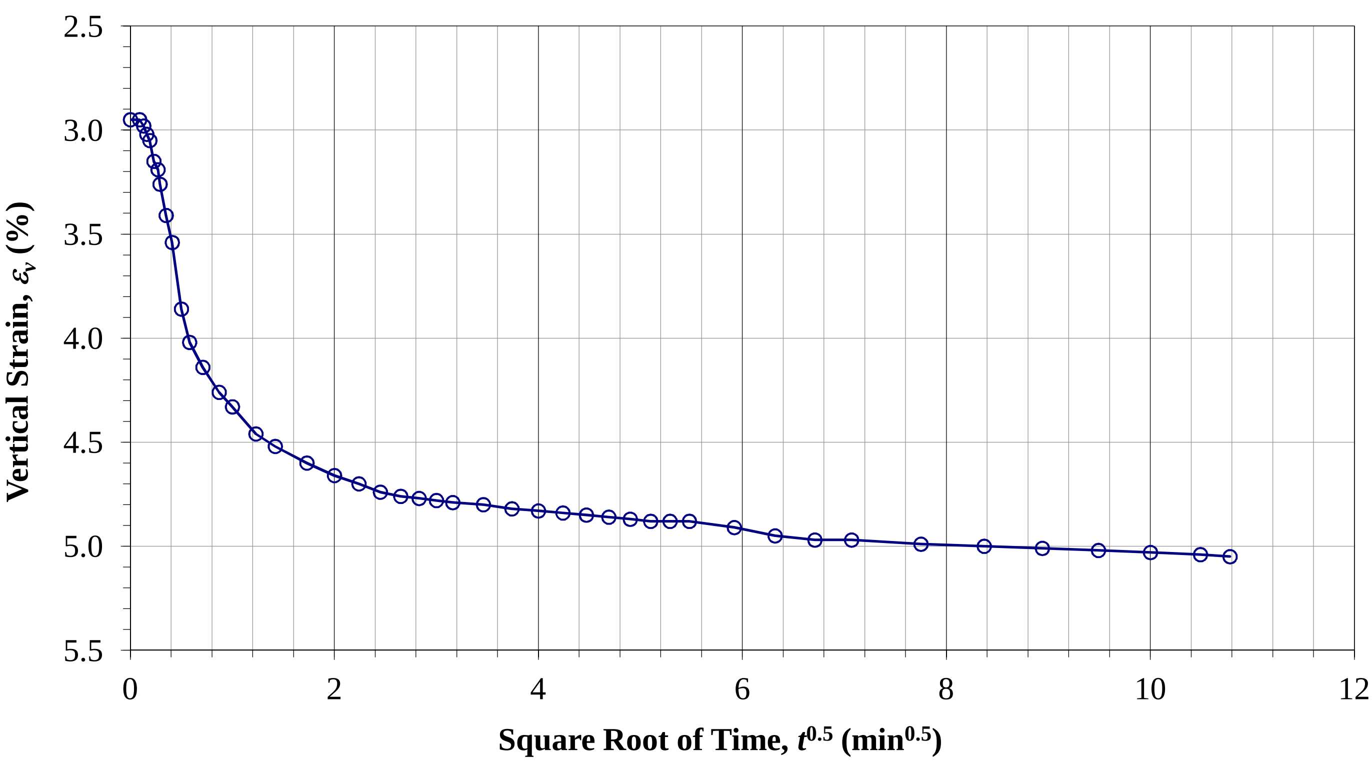
Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-12
Sample:
Depth: 24.5'

Constant Load Step: 6 of 13
Stress: 3200 psf





One-Dimensional Consolidation Properties of Soils

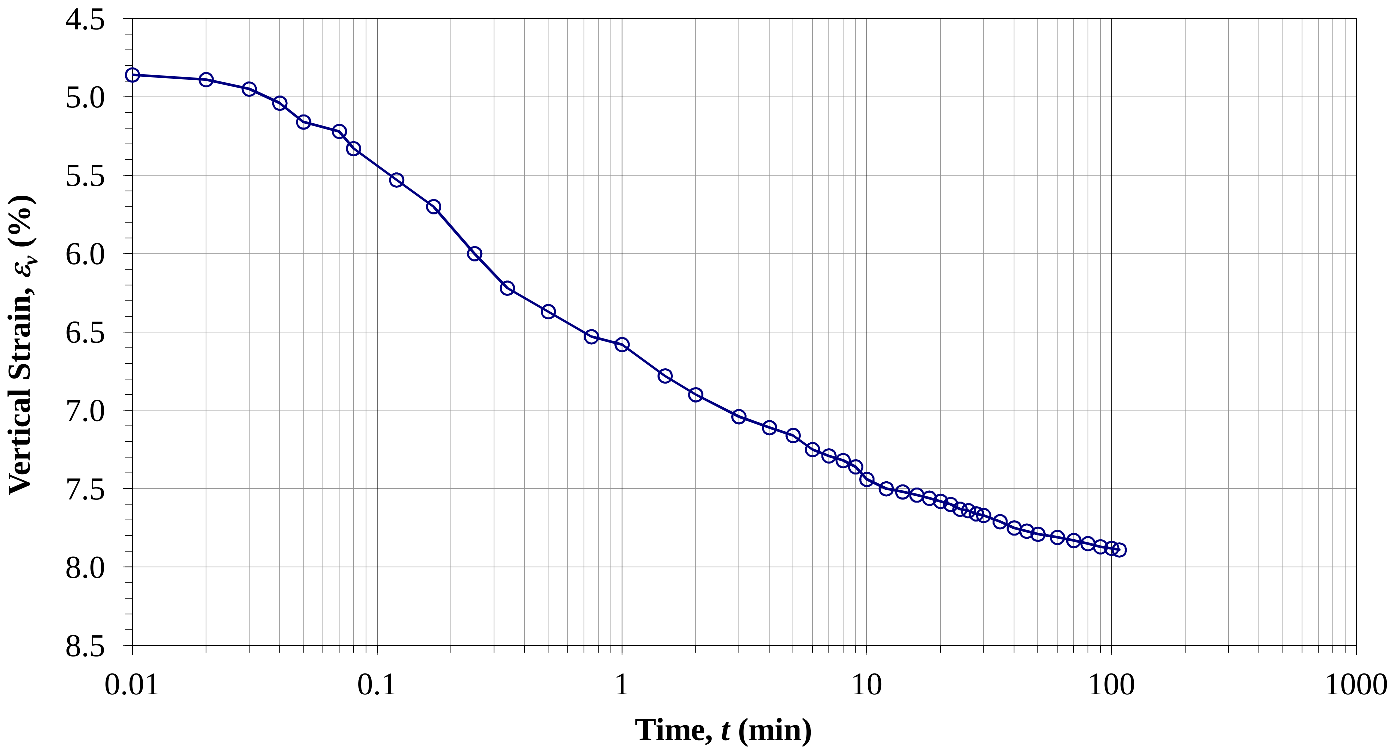
(ASTM D2435)

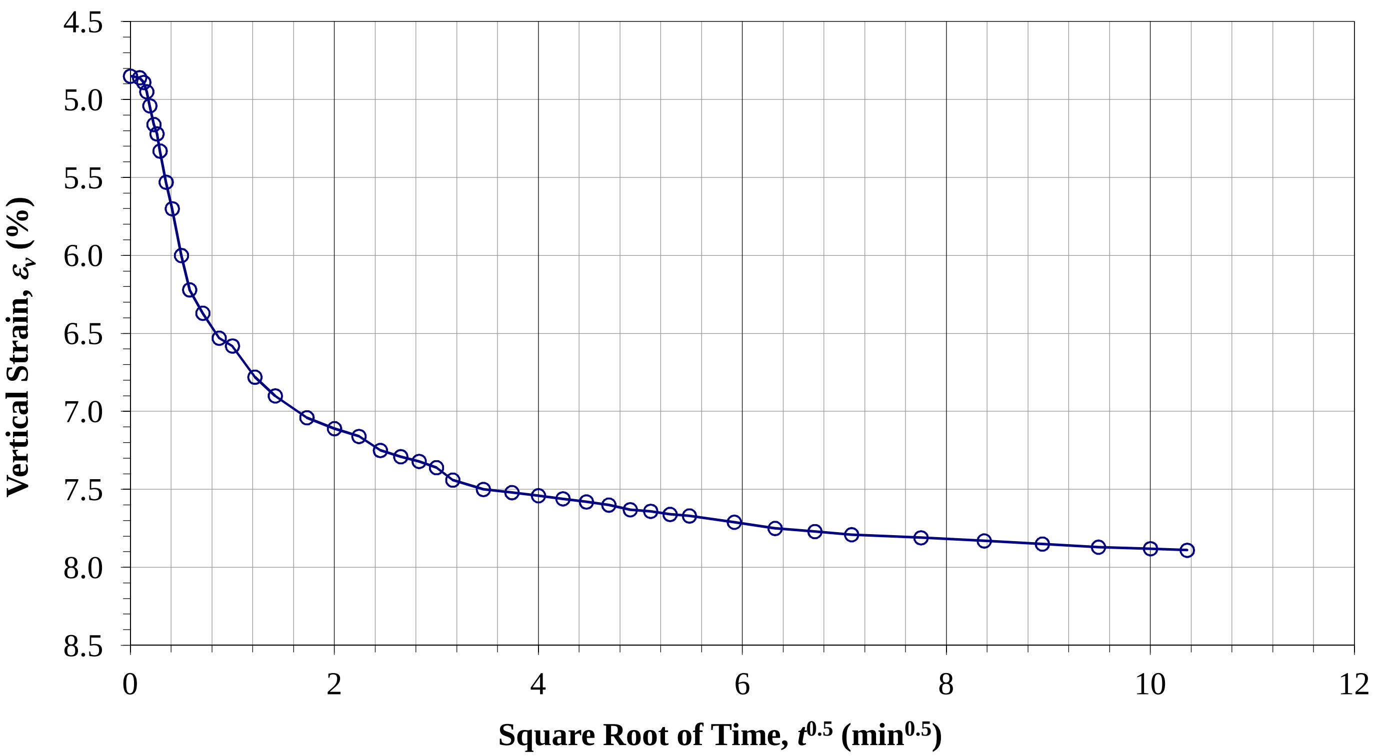
IGES

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-12
Sample:
Depth: 24.5'

Constant Load Step: 7 of 13
Stress: 6400 psf





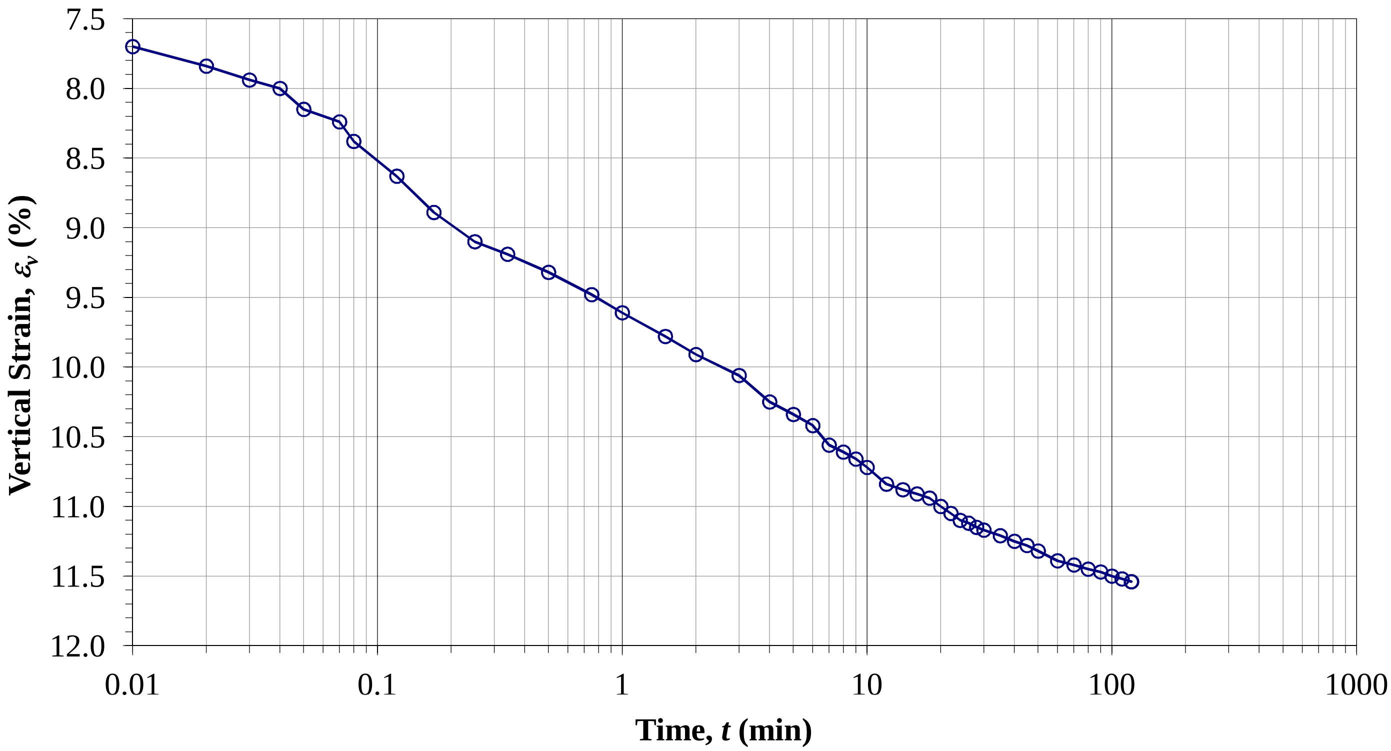
One-Dimensional Consolidation Properties of Soils

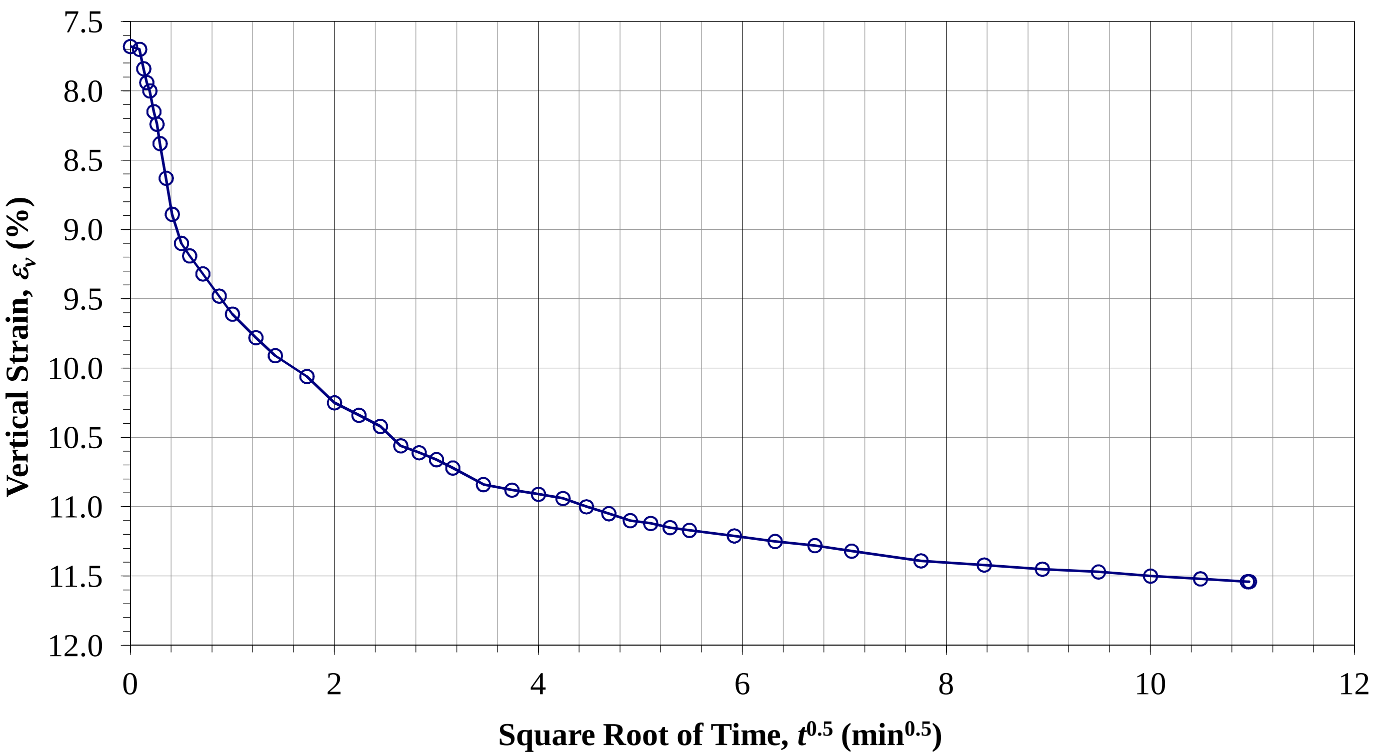
(ASTM D2435)

Project:	**Logan WWTP**	**Boring No.:**	**B-12**
No:	**00823-012**	**Sample:**	
Location:	Logan, Utah	**Depth:**	**24.5'**

Constant Load Step: 8 of 13

Stress: 12800 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP

No: 00823-012

Location: Logan, Utah

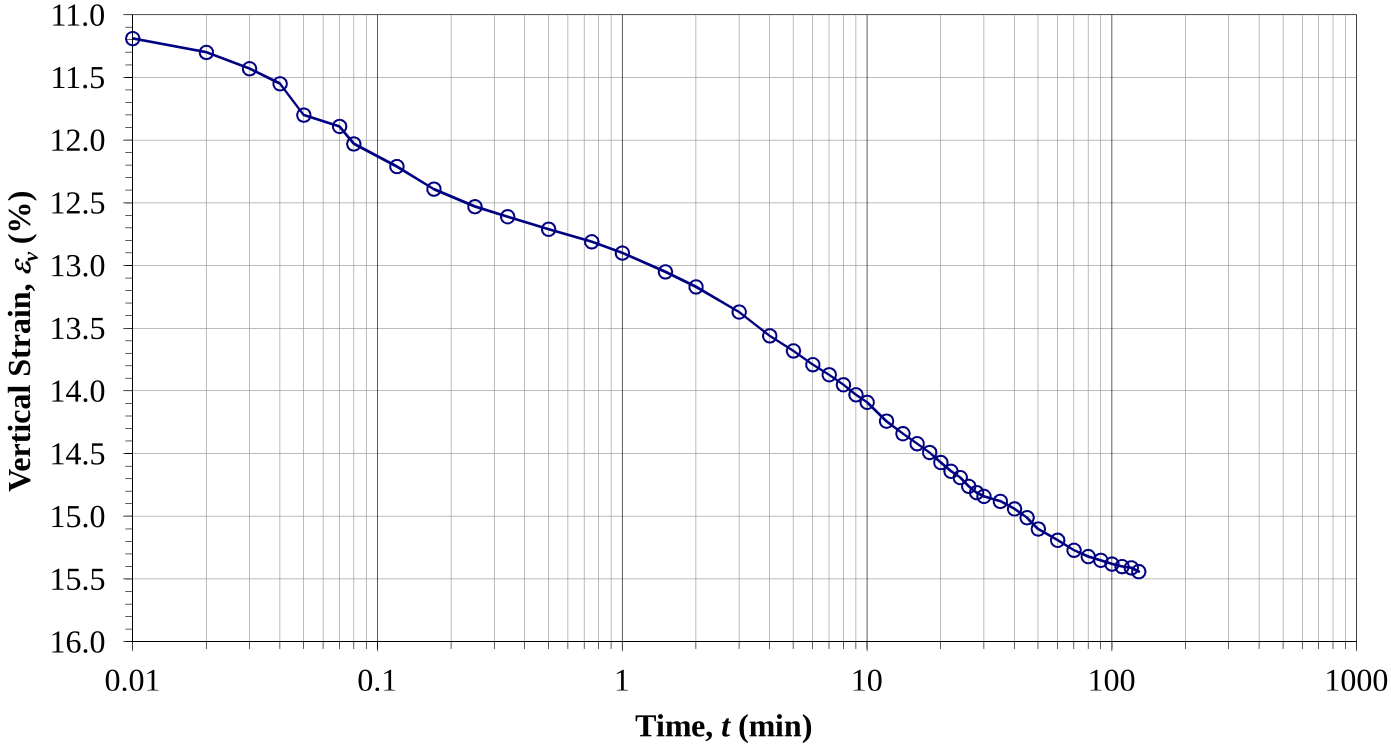
Boring No.: B-12

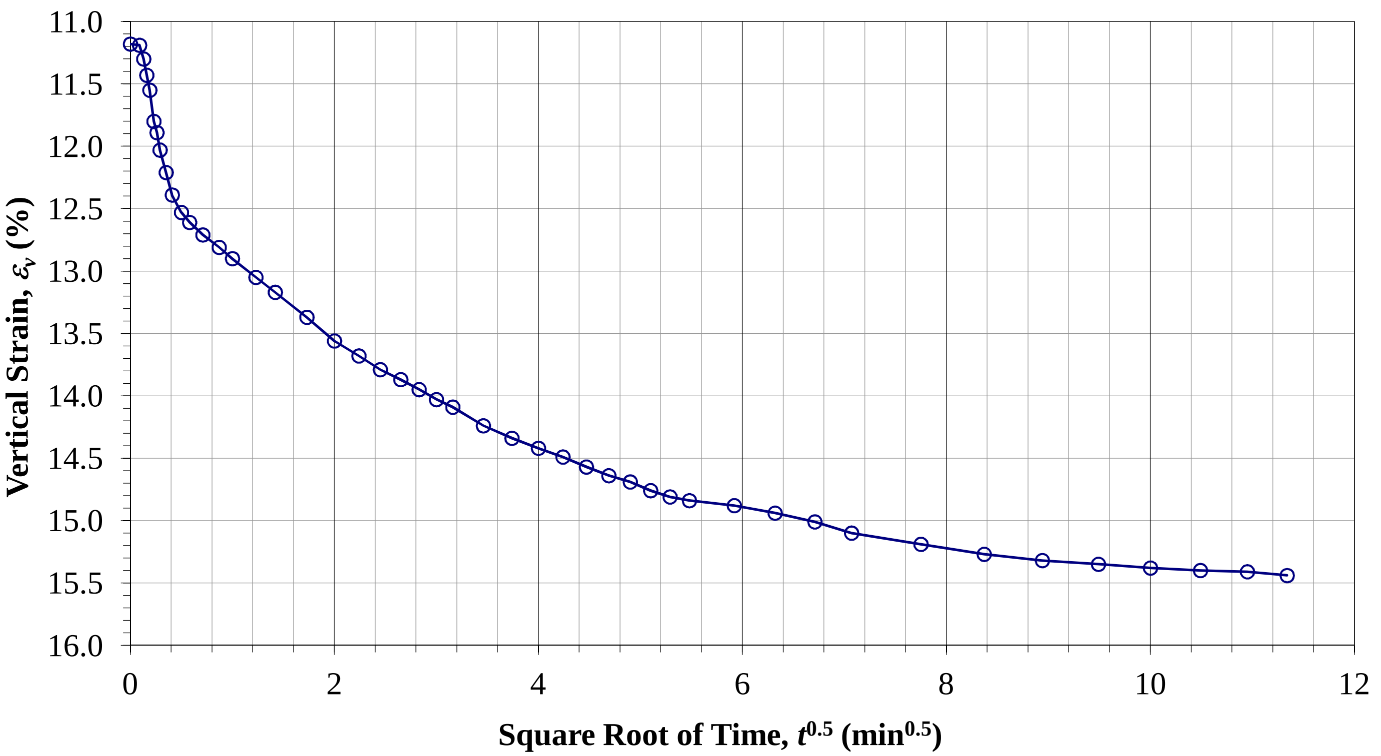
Sample:

Depth: 24.5'

Constant Load Step: 9 of 13

Stress: 25600 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Logan WWTP

No: 00823-012

Location: Logan, Utah

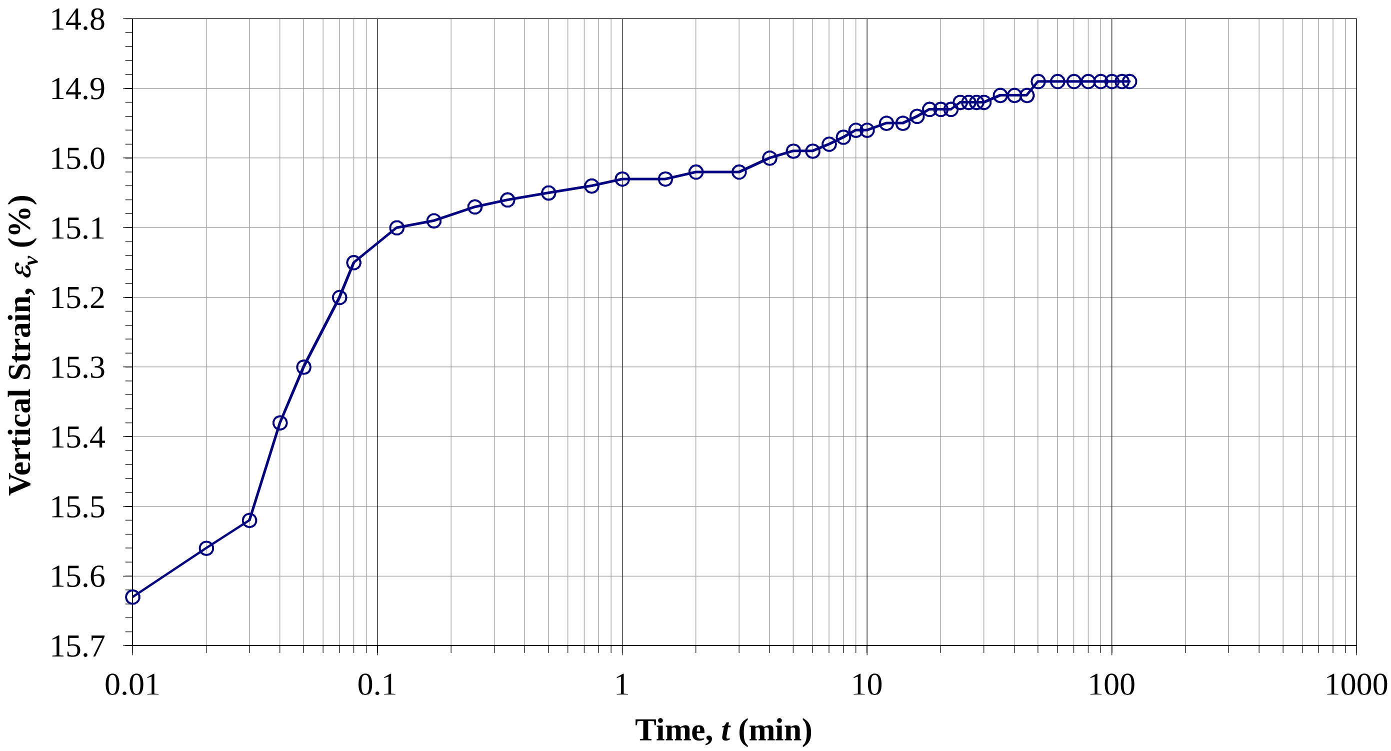
Boring No.: B-12

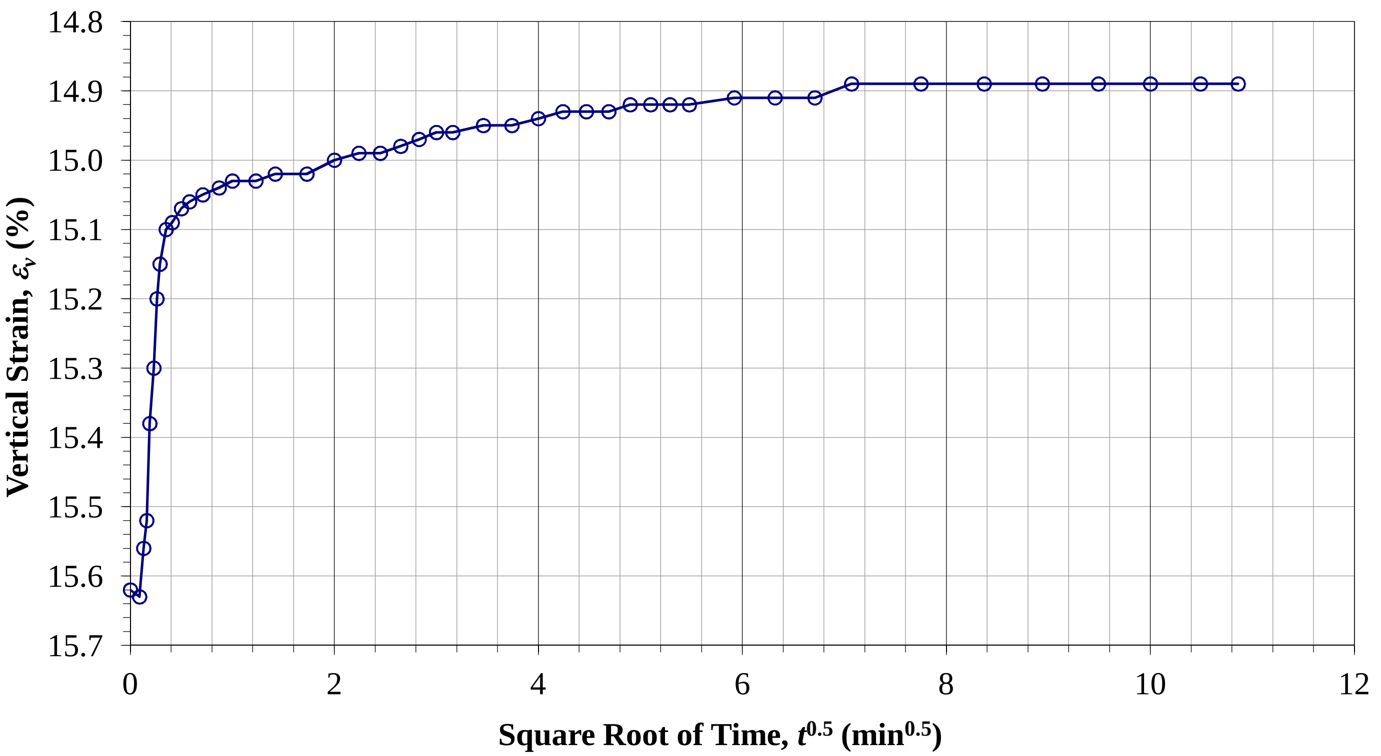
Sample:

Depth: 24.5'

Constant Load Step: 10 of 13

Stress: 12800 psf





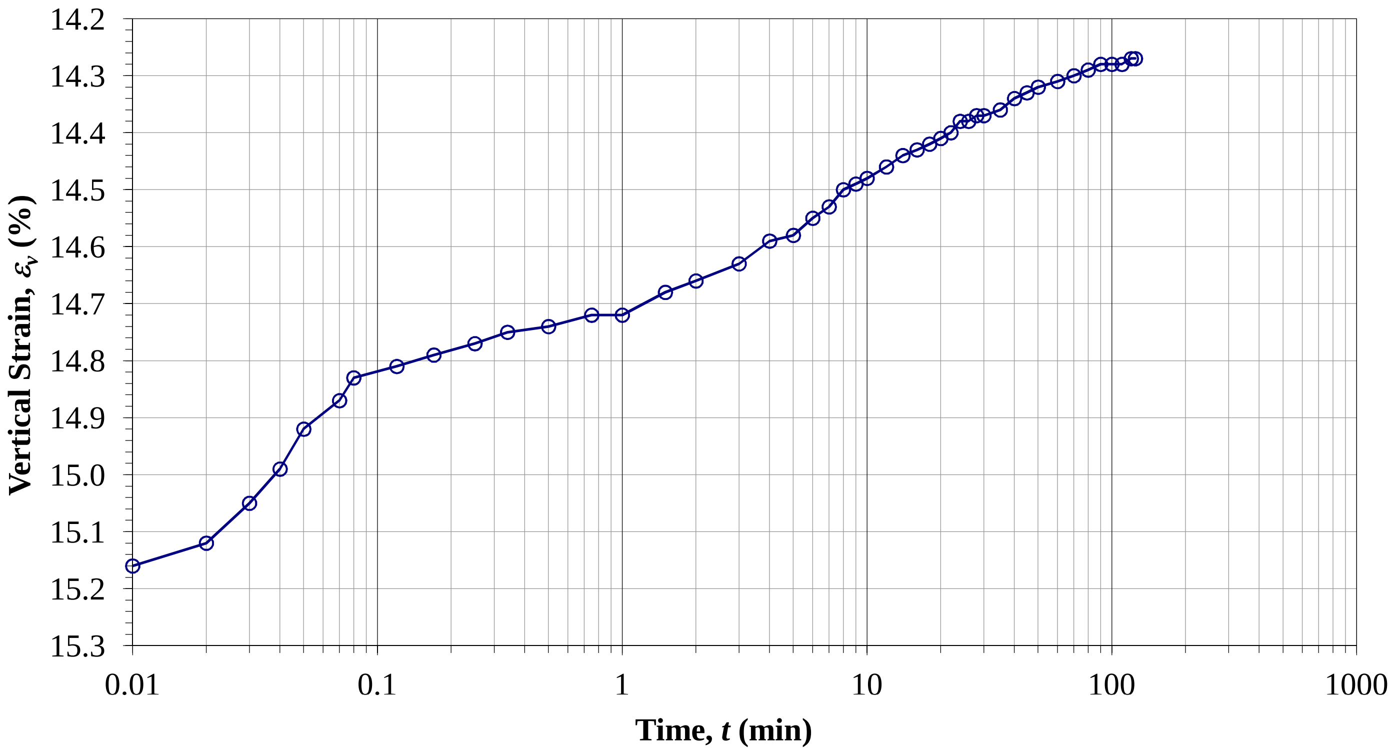
One-Dimensional Consolidation Properties of Soils
(ASTM D2435)

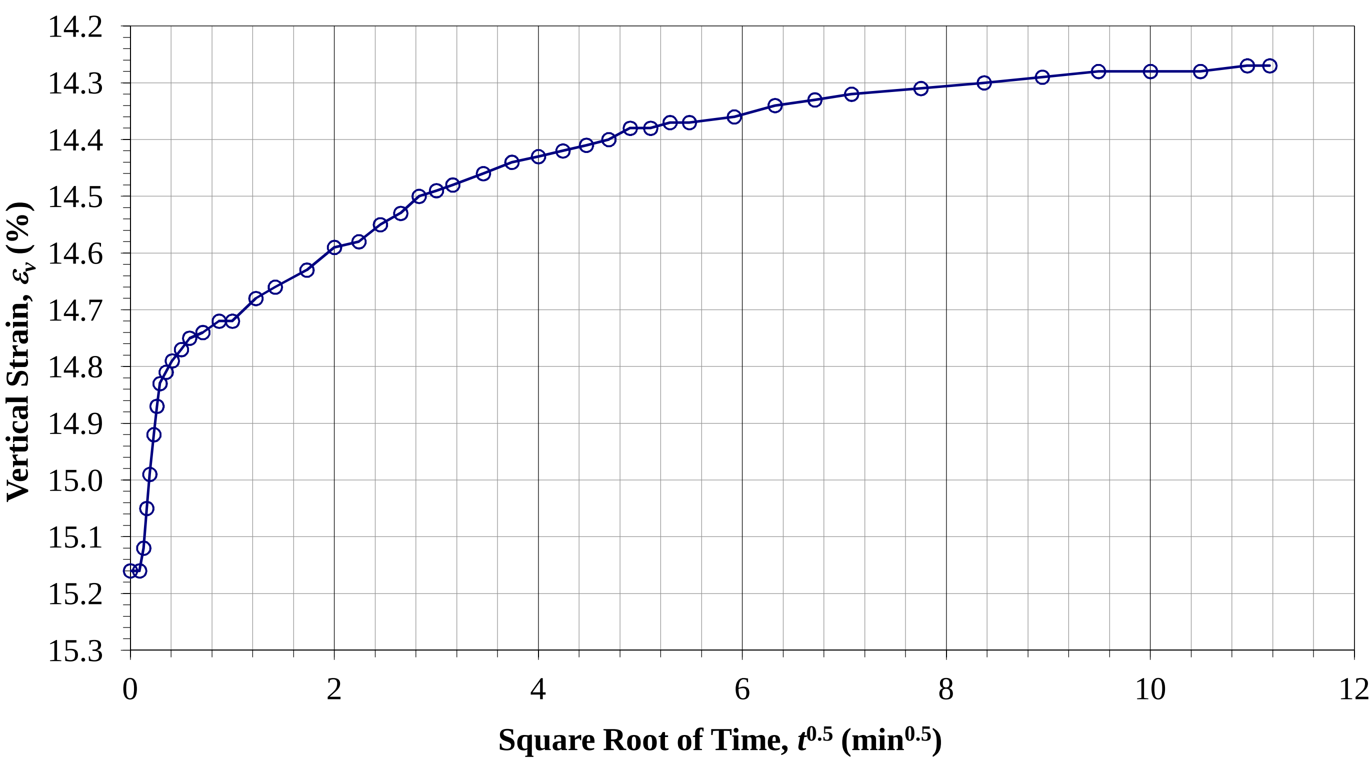
IGES

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-12
Sample:
Depth: 24.5'

Constant Load Step: 11 of 13
Stress: 6400 psf





One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

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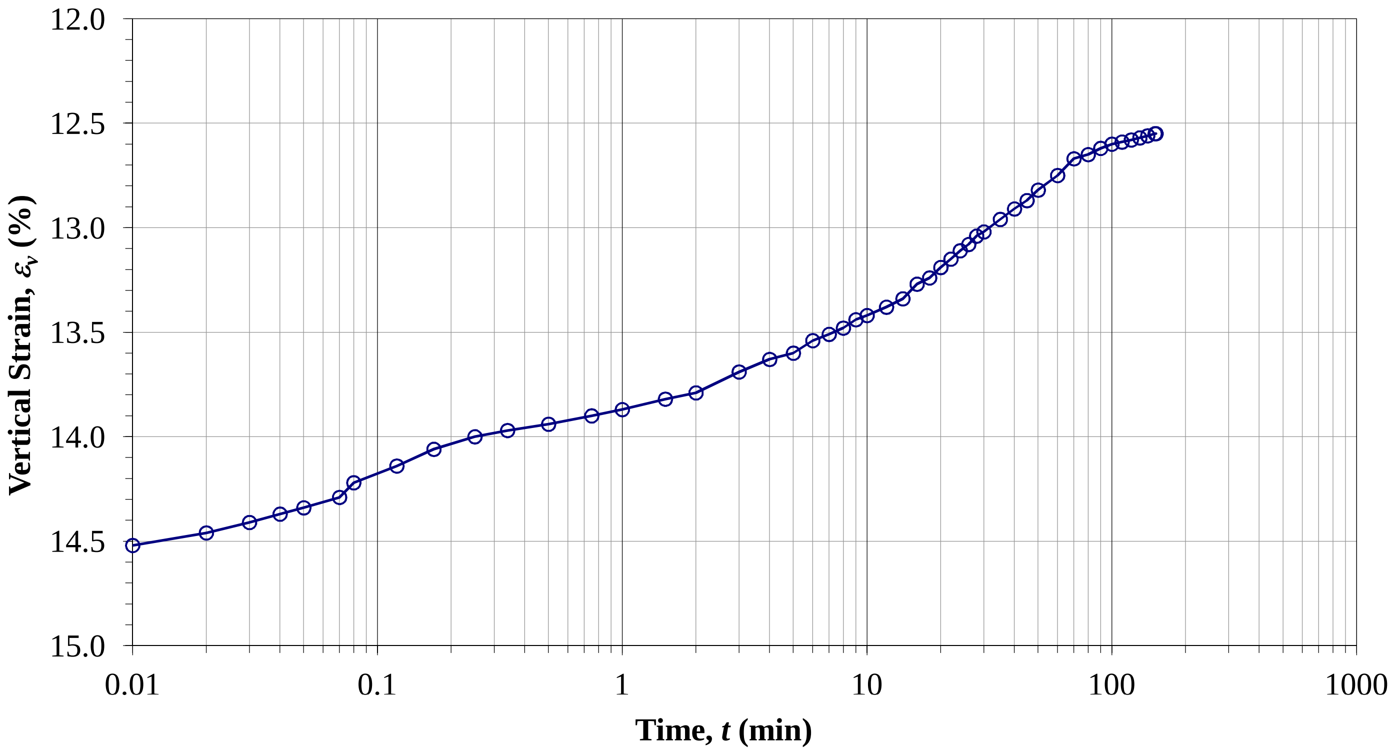
Project: **Logan WWTP** | **Boring No.:** **B-12**

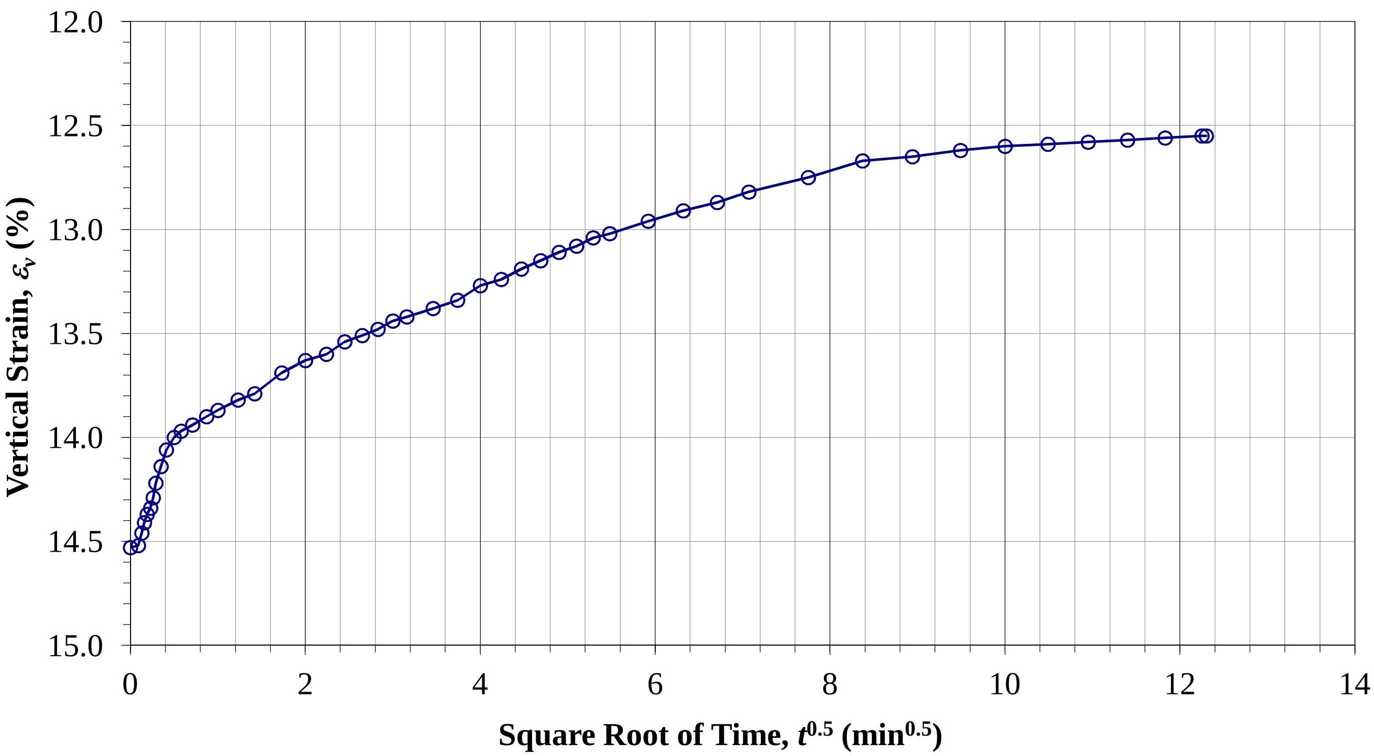
No: **00823-012** | **Sample:**

Location: Logan, Utah | **Depth:** **24.5'**

Constant Load Step: 12 of 13

Stress: 1600 psf





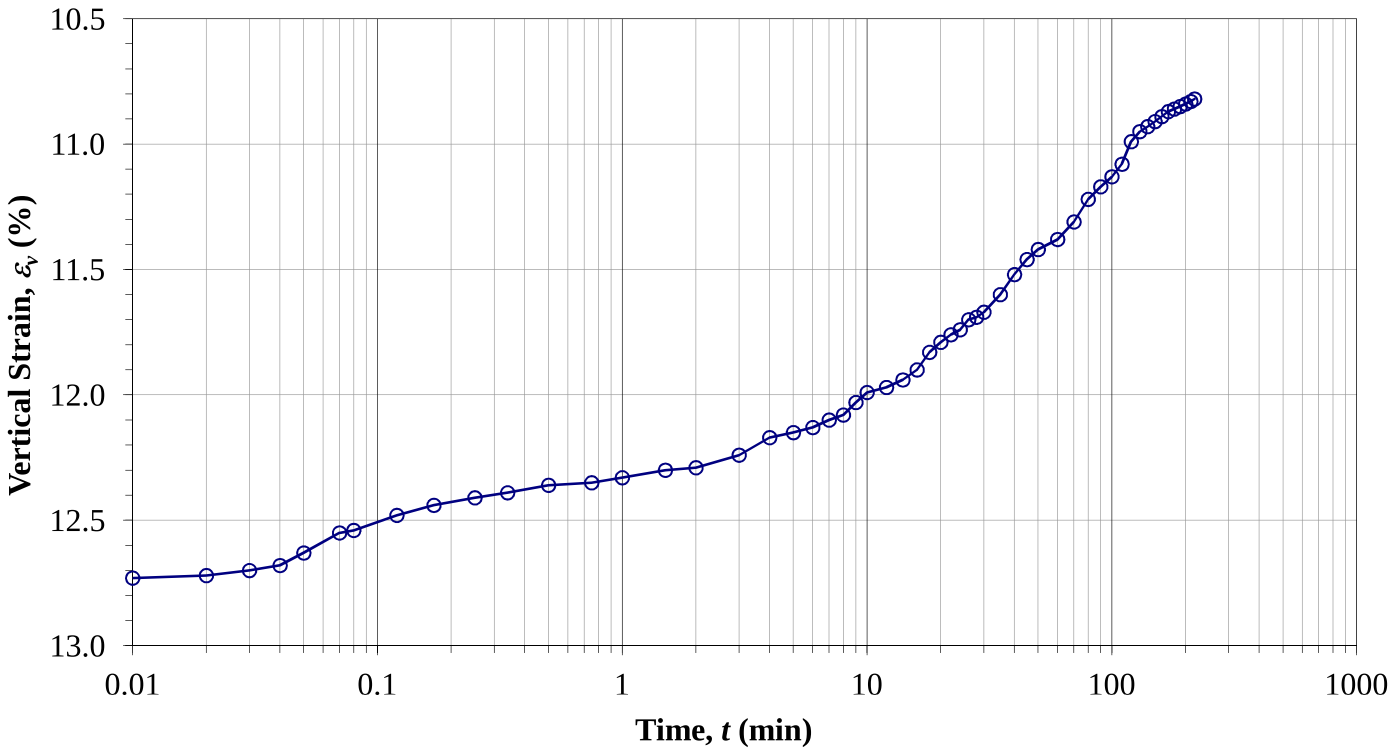
One-Dimensional Consolidation Properties of Soils

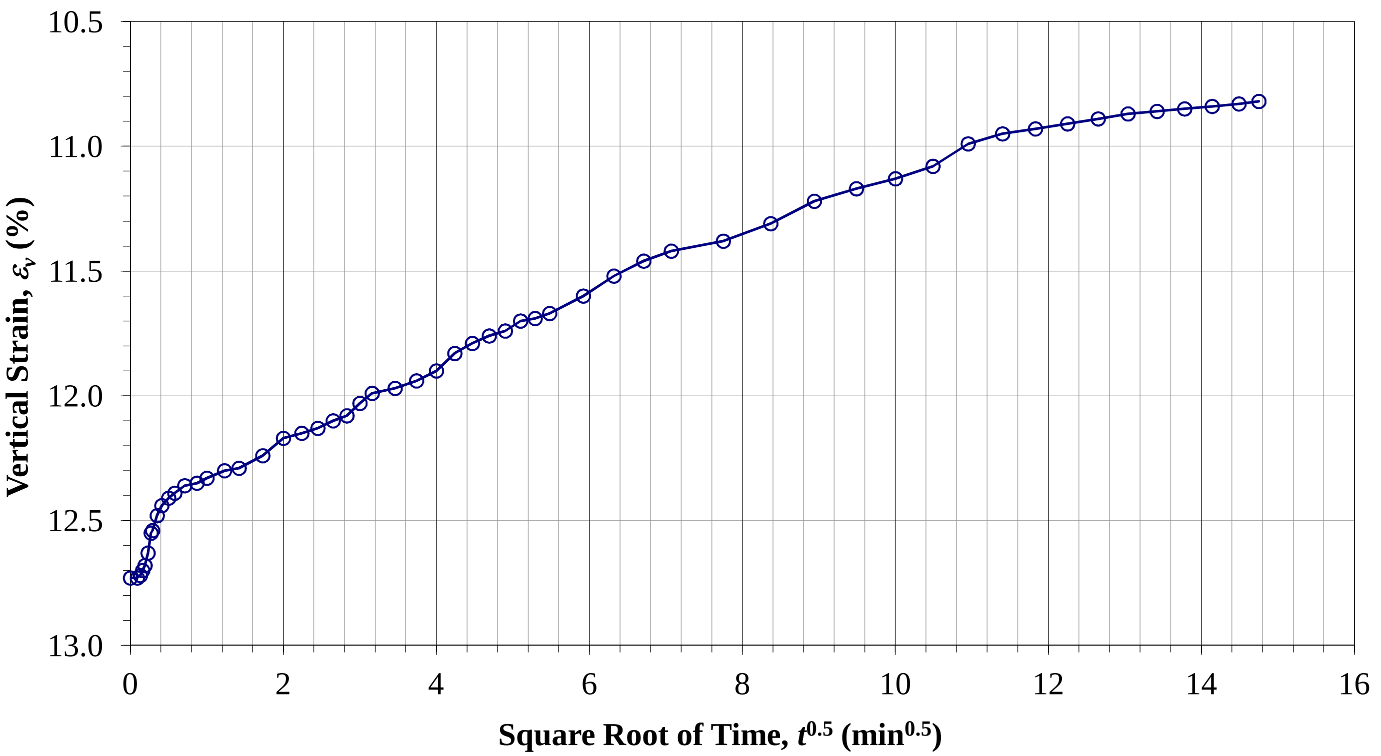
(ASTM D2435)

Project: Logan WWTP
No: 00823-012
Location: Logan, Utah

Boring No.: B-12
Sample:
Depth: 24.5'

Constant Load Step: 13 of 13
Stress: 400 psf





Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

(ASTM D2850)

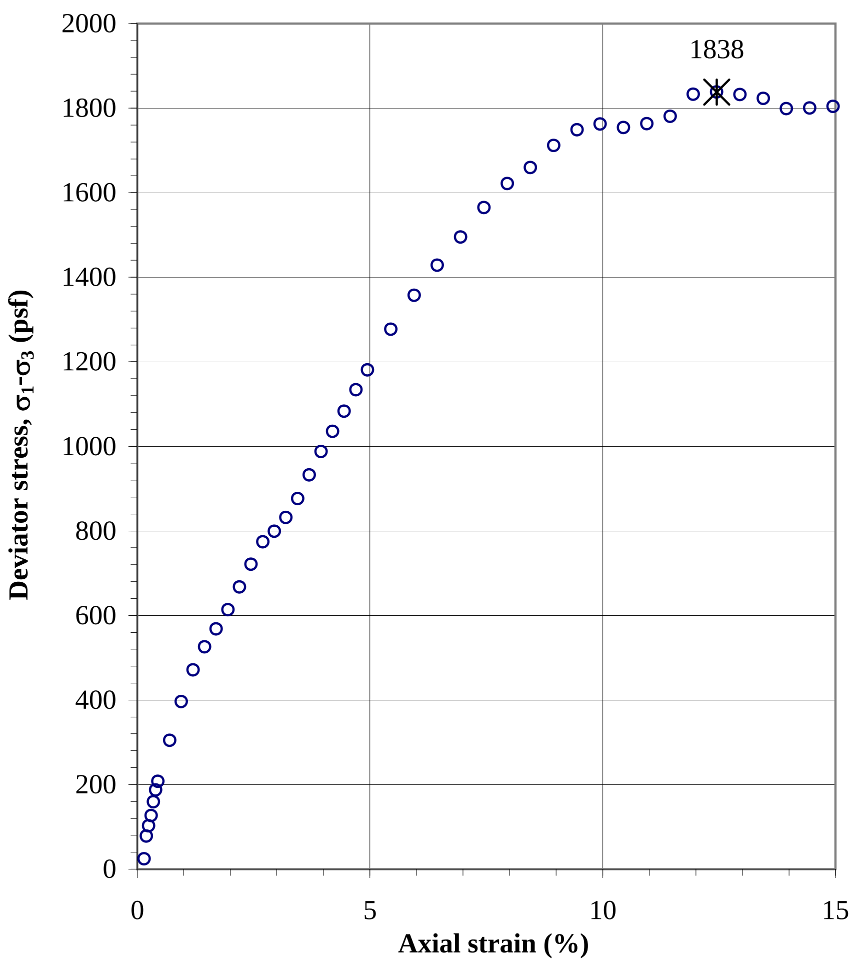
Project: Logan WWTP
No: 00823-012
Location: Logan, UT
Date: 2/14/2013
By: BRR

Boring No.: B-01
Sample:
Depth: 14.5'
Sample Description: Brown clay
Sample type: Undisturbed

Specific gravity, Gs	2.67	Assumed
Sample height, H (in.)	5.522	
Sample diameter, D (in.)	2.418	
Sample volume, V (ft^3)	0.0147	
Wt. rings + wet soil (g)	766.67	
Wt. rings/tare (g)	0.00	
Moist soil, Ws (g)	766.67	
Moist unit wt., γ_m (pcf)	115.2	
Dry unit wt., γ_d (pcf)	**84.1**	
Saturation (%)	100.0	
Void ratio, *e*	0.98	

Wet soil + tare (g)	553.44
Dry soil + tare (g)	452.43
Tare (g)	178.60
Water content, w (%)	**36.9**
Confining stress, σ_3 (psf)	605
Shear rate (in/min)	0.0166
Strain at failure, ε_f (%)	12.45
Deviator stress at failure, $(\sigma_1-\sigma_3)_f$ (psf)	1838
Shear stress at failure, $q_f = (\sigma_1-\sigma_3)_f/2$ (psf)	919

Axial Strain (%)	σ_d $\sigma_1-\sigma_3$ (psf)	Q 1/2 σ_d (psf)
0.15	24.5	12.2
0.20	77.7	38.8
0.25	102.1	51.0
0.30	126.4	63.2
0.35	159.0	79.5
0.40	187.4	93.7
0.45	207.6	103.8
0.70	304.1	152.0
0.95	396.0	198.0
1.20	471.2	235.6
1.45	525.7	262.9
1.70	567.8	283.9
1.95	613.7	306.8
2.20	667.4	333.7
2.45	720.8	360.4
2.70	773.9	386.9
2.95	798.8	399.4
3.20	831.4	415.7
3.45	875.9	437.9
3.70	931.9	465.9
3.95	987.7	493.8
4.20	1035.2	517.6
4.45	1082.6	541.3
4.70	1133.5	566.7
4.95	1180.3	590.1
5.45	1276.8	638.4
5.95	1356.8	678.4
6.45	1428.2	714.1
6.95	1494.8	747.4
7.45	1564.4	782.2
7.95	1621.7	810.8
8.45	1659.6	829.8
8.95	1711.8	855.9
9.45	1748.4	874.2
9.95	1762.2	881.1
10.45	1753.7	876.8
10.95	1763.3	881.6
11.45	1780.1	890.0
11.95	1832.9	916.4
12.45	1837.9	918.9
12.95	1832.0	916.0
13.45	1822.5	911.2
13.95	1798.7	899.3
14.45	1799.8	899.9
14.95	1804.1	902.0



Entered by:___________

Reviewed:___________

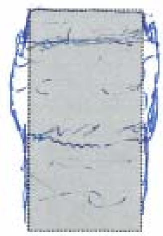
Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

(ASTM D2850)

Project: Logan WWTP
No: 00823-012
Location: Logan, UT
Date: 2/19/2013
By: BRR

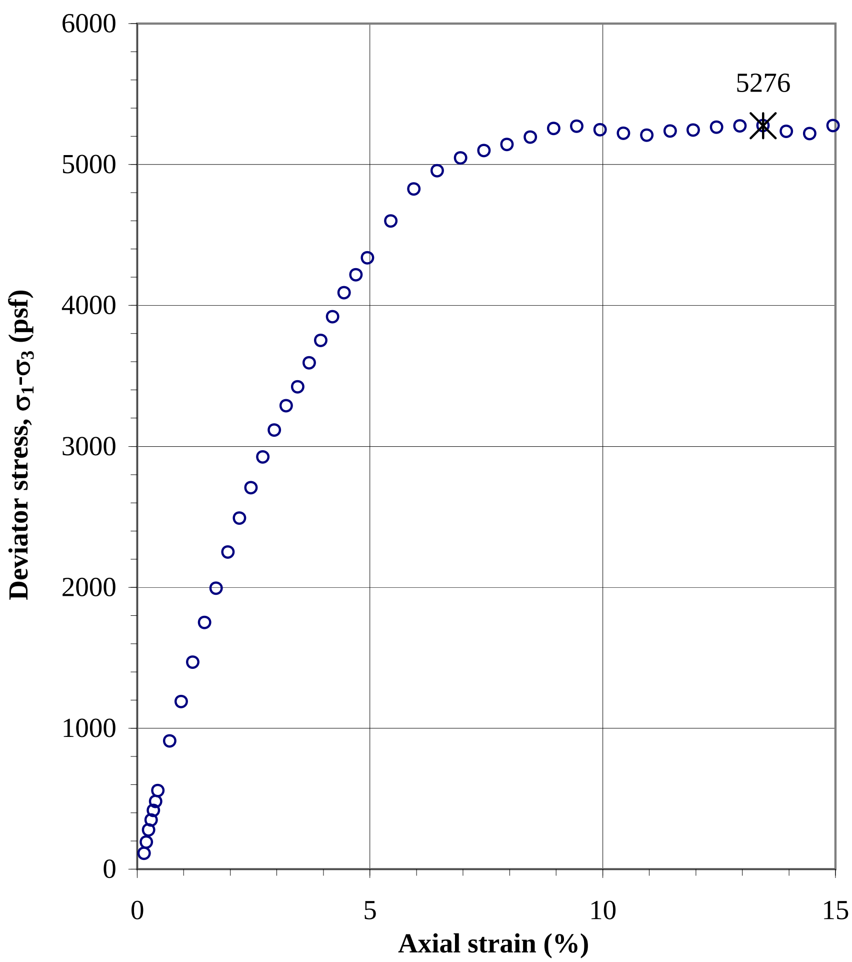
Boring No.: B-01
Sample:
Depth: 44.5'
Sample Description: Brown/grey silty sand
Sample type: Undisturbed

Specific gravity, Gs	2.73	Assumed
Sample height, H (in.)	5.854	
Sample diameter, D (in.)	2.407	
Sample volume, V (ft^3)	0.0154	
Wt. rings + wet soil (g)	894.97	
Wt. rings/tare (g)	0.00	
Moist soil, Ws (g)	894.97	
Moist unit wt., γ_m (pcf)	128.0	
Dry unit wt., γ_d (pcf)	**103.3**	
Saturation (%)	100.0	
Void ratio, *e*	0.65	



Wet soil + tare (g)	1177.80
Dry soil + tare (g)	1006.19
Tare (g)	288.42
Water content, w (%)	**23.9**
Confining stress, σ_3 (psf)	1498
Shear rate (in/min)	0.0176
Strain at failure, ε_f (%)	13.45
Deviator stress at failure, $(\sigma_1-\sigma_3)_f$ (psf)	5276
Shear stress at failure, $q_f = (\sigma_1-\sigma_3)_f/2$ (psf)	2638

Axial Strain (%)	σ_d $\sigma_1-\sigma_3$ (psf)	Q 1/2 σ_d (psf)
0.15	111.7	55.9
0.20	190.2	95.1
0.25	276.8	138.4
0.30	346.9	173.4
0.35	416.8	208.4
0.40	478.3	239.1
0.45	556.4	278.2
0.70	908.3	454.1
0.95	1188.4	594.2
1.20	1467.2	733.6
1.45	1748.5	874.2
1.70	1991.7	995.8
1.95	2249.8	1124.9
2.20	2490.4	1245.2
2.45	2705.4	1352.7
2.70	2923.2	1461.6
2.95	3115.8	1557.9
3.20	3287.0	1643.5
3.45	3421.3	1710.6
3.70	3590.9	1795.4
3.95	3751.6	1875.8
4.20	3919.2	1959.6
4.45	4090.1	2045.0
4.70	4216.2	2108.1
4.95	4337.7	2168.8
5.45	4598.3	2299.1
5.95	4824.7	2412.3
6.45	4954.9	2477.4
6.95	5044.8	2522.4
7.45	5098.7	2549.3
7.95	5140.4	2570.2
8.45	5192.4	2596.2
8.95	5255.2	2627.6
9.45	5271.6	2635.8
9.95	5246.3	2623.1
10.45	5220.9	2610.4
10.95	5206.5	2603.2
11.45	5236.0	2618.0
11.95	5243.1	2621.5
12.45	5264.2	2632.1
12.95	5273.7	2636.8
13.45	5275.7	2637.8
13.95	5234.1	2617.0
14.45	5217.6	2608.8
14.95	5275.2	2637.6



Entered by:___________

Reviewed:___________

Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

(ASTM D2850)

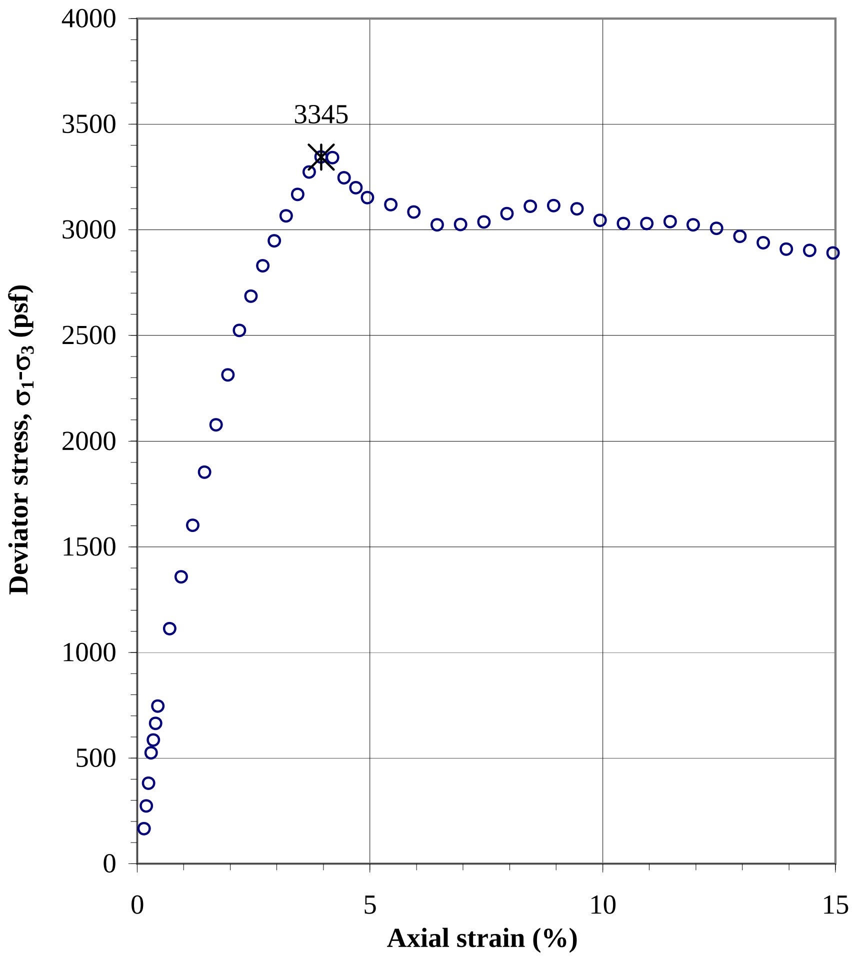
Project: Logan WWTP
No: 00823-012
Location: Logan, UT
Date: 2/19/2013
By: BRR

Boring No.: B-02
Sample:
Depth: 9.5'
Sample Description: Brown clay
Sample type: Undisturbed

Specific gravity, Gs	2.67	Assumed
Sample height, H (in.)	5.815	
Sample diameter, D (in.)	2.408	
Sample volume, V (ft^3)	0.0153	
Wt. rings + wet soil (g)	823.08	
Wt. rings/tare (g)	0.00	
Moist soil, Ws (g)	823.08	
Moist unit wt., γ_m (pcf)	118.4	
Dry unit wt., γ_d (pcf)	**89.4**	
Saturation (%)	99.8	
Void ratio, *e*	0.87	

Wet soil + tare (g)	1031.91
Dry soil + tare (g)	831.03
Tare (g)	211.60
Water content, w (%)	**32.4**
Confining stress, σ_3 (psf)	500
Shear rate (in/min)	0.0174
Strain at failure, ε_f (%)	3.95
Deviator stress at failure, $(\sigma_1-\sigma_3)_f$ (psf)	3345
Shear stress at failure, $q_f = (\sigma_1-\sigma_3)_f/2$ (psf)	1672

Axial Strain (%)	σ_d $\sigma_1-\sigma_3$ (psf)	Q 1/2 σ_d (psf)
0.15	165.4	82.7
0.20	272.5	136.3
0.25	379.5	189.8
0.30	523.7	261.9
0.35	585.0	292.5
0.40	662.8	331.4
0.45	744.6	372.3
0.70	1111.1	555.6
0.95	1356.5	678.3
1.20	1600.7	800.4
1.45	1851.7	925.9
1.70	2077.0	1038.5
1.95	2313.2	1156.6
2.20	2523.9	1262.0
2.45	2684.8	1342.4
2.70	2828.7	1414.4
2.95	2947.6	1473.8
3.20	3065.8	1532.9
3.45	3167.4	1583.7
3.70	3272.4	1636.2
3.95	3344.8	1672.4
4.20	3341.2	1670.6
4.45	3246.3	1623.2
4.70	3199.3	1599.7
4.95	3152.4	1576.2
5.45	3118.4	1559.2
5.95	3084.4	1542.2
6.45	3023.3	1511.7
6.95	3024.5	1512.3
7.45	3036.8	1518.4
7.95	3075.8	1537.9
8.45	3110.2	1555.1
8.95	3113.6	1556.8
9.45	3098.1	1549.1
9.95	3045.0	1522.5
10.45	3029.3	1514.7
10.95	3028.5	1514.3
11.45	3038.5	1519.3
11.95	3022.5	1511.3
12.45	3006.4	1503.2
12.95	2968.5	1484.3
13.45	2938.0	1469.0
13.95	2907.5	1453.8
14.45	2902.0	1451.0
14.95	2889.2	1444.6



Entered by:___________

Reviewed:___________

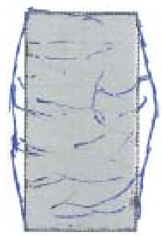
Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

(ASTM D2850)

IGES

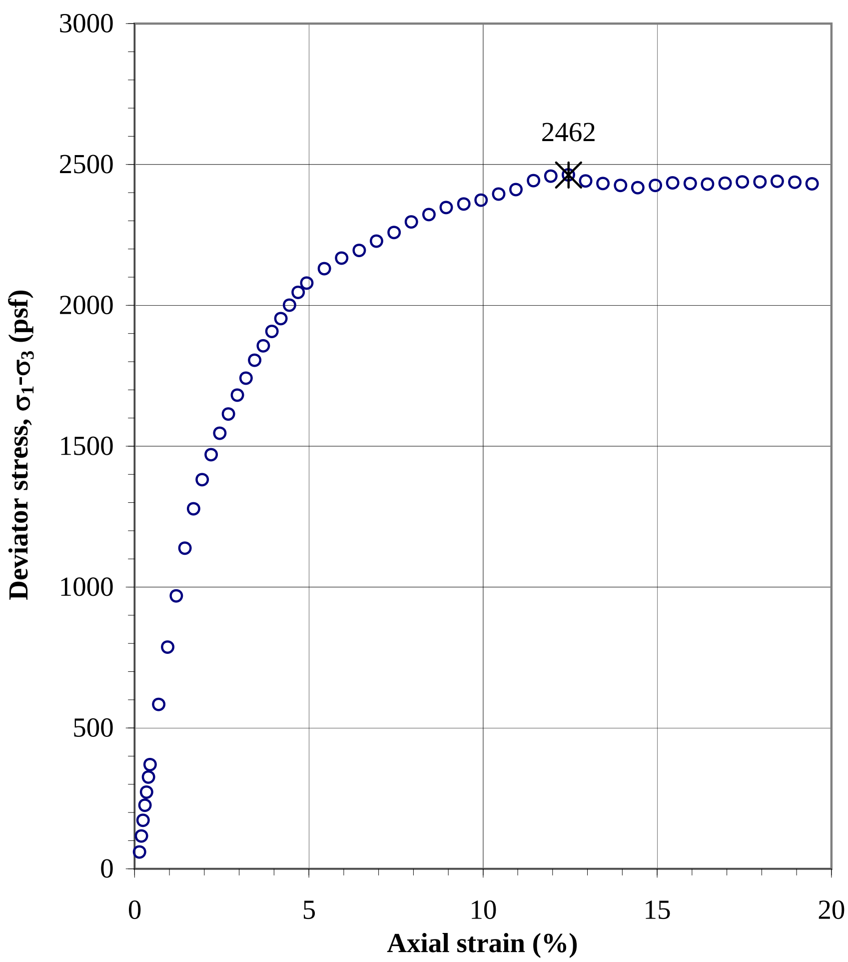
Project:	Logan WWTP	**Boring No.:**	B-02
No:	00823-012	**Sample:**	
Location:	Logan, UT	**Depth:**	39.5'
Date:	2/27/2013	Sample Description:	Grey clay
By:	NB	Sample type:	Undisturbed

Specific gravity, Gs	2.73	Assumed
Sample height, H (in.)	6.034	
Sample diameter, D (in.)	2.845	
Sample volume, V (ft^3)	0.0222	
Wt. rings + wet soil (g)	1289.08	
Wt. rings/tare (g)	0.00	
Moist soil, Ws (g)	1289.08	
Moist unit wt., γ_m (pcf)	128.0	
Dry unit wt., γ_d (pcf)	**103.3**	
Saturation (%)	100.0	
Void ratio, *e*	0.66	



Wet soil + tare (g)	403.17
Dry soil + tare (g)	348.87
Tare (g)	122.30
Water content, w (%)	**24.0**
Confining stress, σ_3 (psf)	1500
Shear rate (in/min)	0.0181
Strain at failure, ε_f (%)	12.45
Deviator stress at failure, $(\sigma_1\text{-}\sigma_3)_f$ (psf)	2462
Shear stress at failure, $q_f = (\sigma_1\text{-}\sigma_3)_f/2$ (psf)	1231

Axial Strain (%)	σ_d σ_1-σ_3 (psf)	Q 1/2 σ_d (psf)
0.15	59.2	29.6
0.20	115.4	57.7
0.25	171.5	85.8
0.30	224.6	112.3
0.35	271.8	135.9
0.40	324.7	162.4
0.45	368.8	184.4
0.70	582.5	291.2
0.95	786.3	393.1
1.20	968.5	484.2
1.45	1138.0	569.0
1.70	1277.4	638.7
1.95	1381.0	690.5
2.20	1469.5	734.7
2.45	1545.9	772.9
2.70	1613.3	806.6
2.95	1680.2	840.1
3.20	1741.1	870.5
3.45	1804.5	902.2
3.70	1856.0	928.0
3.95	1907.3	953.6
4.20	1952.5	976.2
4.45	2000.4	1000.2
4.70	2045.0	1022.5
4.95	2078.2	1039.1
5.45	2129.8	1064.9
5.95	2166.6	1083.3
6.45	2194.7	1097.3
6.95	2227.8	1113.9
7.45	2257.6	1128.8
7.95	2295.2	1147.6
8.45	2321.2	1160.6
8.95	2347.0	1173.5
9.45	2358.7	1179.3
9.95	2372.8	1186.4
10.45	2394.6	1197.3
10.95	2410.8	1205.4
11.45	2442.2	1221.1
11.95	2457.5	1228.7
12.45	2462.0	1231.0
12.95	2440.4	1220.2
13.45	2431.7	1215.8
13.95	2425.5	1212.7
14.45	2416.6	1208.3
14.95	2425.4	1212.7
15.45	2433.8	1216.9
15.95	2431.9	1215.9
16.45	2429.9	1214.9
16.95	2432.6	1216.3
17.45	2437.6	1218.8
17.95	2437.3	1218.6
18.45	2439.3	1219.6
18.95	2436.2	1218.1
19.45	2430.6	1215.3
19.85	2426.1	1213.0



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Reviewed:___________

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Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

(ASTM D2850)

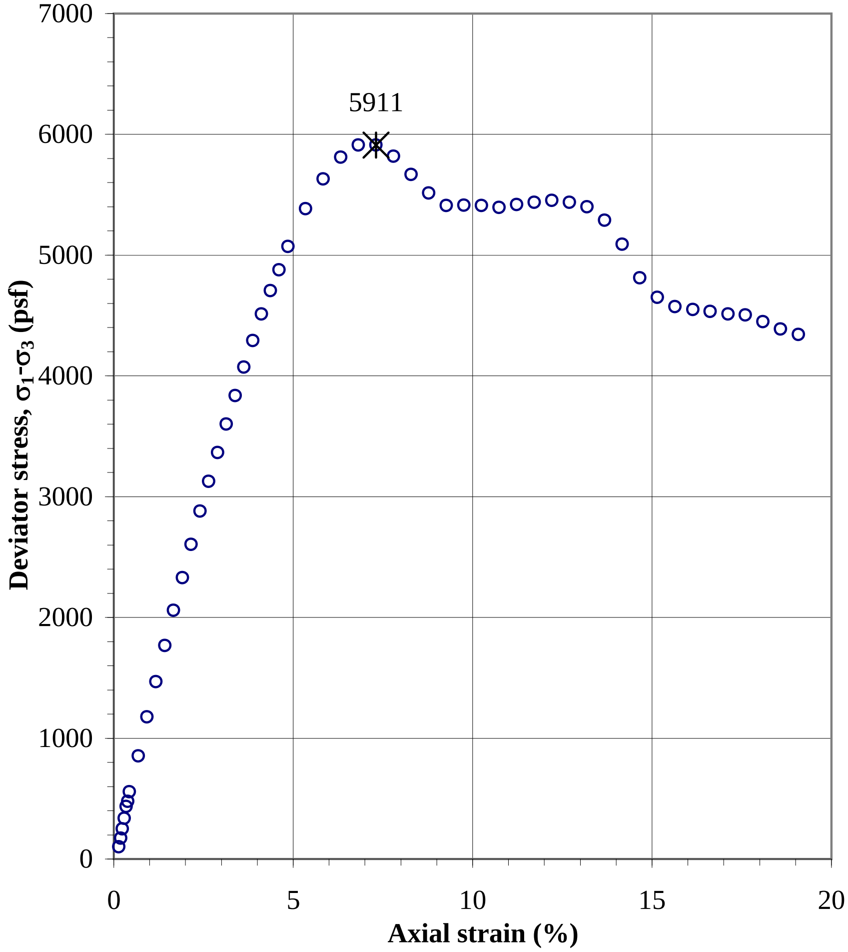
Project: Logan WWTP
No: 00823-012
Location: Logan, UT
Date: 2/15/2013
By: MP

Boring No.: B-05
Sample:
Depth: 39.5'
Sample Description: Tan silt
Sample type: Undisturbed

Specific gravity, Gs	2.73	Assumed
Sample height, H (in.)	4.649	
Sample diameter, D (in.)	2.381	
Sample volume, V (ft^3)	0.0120	
Wt. rings + wet soil (g)	717.64	
Wt. rings/tare (g)	0.00	
Moist soil, Ws (g)	717.64	
Moist unit wt., γ_m (pcf)	132.1	
Dry unit wt., γ_d (pcf)	**107.6**	
Saturation (%)	100.0	
Void ratio, *e*	0.59	

Wet soil + tare (g)	858.27
Dry soil + tare (g)	727.37
Tare (g)	150.76
Water content, w (%)	**22.7**
Confining stress, σ_3 (psf)	1200
Shear rate (in/min)	0.0139
Strain at failure, ε_f (%)	7.31
Deviator stress at failure, $(\sigma_1-\sigma_3)_f$ (psf)	5911
Shear stress at failure, $q_f = (\sigma_1-\sigma_3)_f/2$ (psf)	2956

Axial Strain (%)	σ_d $\sigma_1-\sigma_3$ (psf)	Q 1/2 σ_d (psf)
0.15	101.5	50.8
0.20	173.2	86.6
0.24	249.1	124.6
0.29	337.6	168.8
0.34	434.5	217.3
0.39	476.3	238.2
0.44	556.1	278.1
0.69	852.7	426.4
0.93	1177.2	588.6
1.18	1466.6	733.3
1.42	1767.1	883.6
1.67	2057.6	1028.8
1.91	2330.1	1165.1
2.16	2605.3	1302.7
2.40	2879.1	1439.6
2.65	3126.7	1563.4
2.89	3364.7	1682.4
3.14	3601.5	1800.8
3.38	3837.0	1918.5
3.63	4071.2	2035.6
3.87	4292.0	2146.0
4.12	4511.5	2255.8
4.36	4705.6	2352.8
4.61	4878.3	2439.2
4.86	5070.2	2535.1
5.34	5382.6	2691.3
5.84	5631.3	2815.7
6.33	5809.6	2904.8
6.82	5910.3	2955.2
7.31	5911.2	2955.6
7.80	5817.9	2909.0
8.29	5666.5	2833.3
8.78	5512.6	2756.3
9.27	5410.2	2705.1
9.76	5412.0	2706.0
10.25	5409.6	2704.8
10.74	5395.4	2697.7
11.23	5418.8	2709.4
11.72	5437.7	2718.9
12.21	5452.5	2726.3
12.70	5436.9	2718.5
13.19	5399.1	2699.6
13.68	5288.0	2644.0
14.17	5090.2	2545.1
14.66	4810.9	2405.5
15.15	4649.8	2324.9
15.65	4572.6	2286.3
16.14	4549.3	2274.7
16.63	4533.2	2266.6
17.12	4513.2	2256.6
17.61	4503.8	2251.9
18.10	4448.8	2224.4
18.59	4387.1	2193.6
19.08	4343.0	2171.5
19.42	4335.5	2167.8



Comments:

Specimen could not be trimmed down to required height to diameter ratio due to the softness of the soil.

Entered by:___________

Reviewed:___________

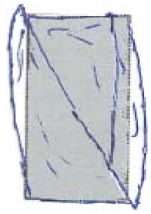
Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

(ASTM D2850)

Project: Logan WWTP
No: 00823-012
Location: Logan, UT
Date: 2/22/2013
By: NB

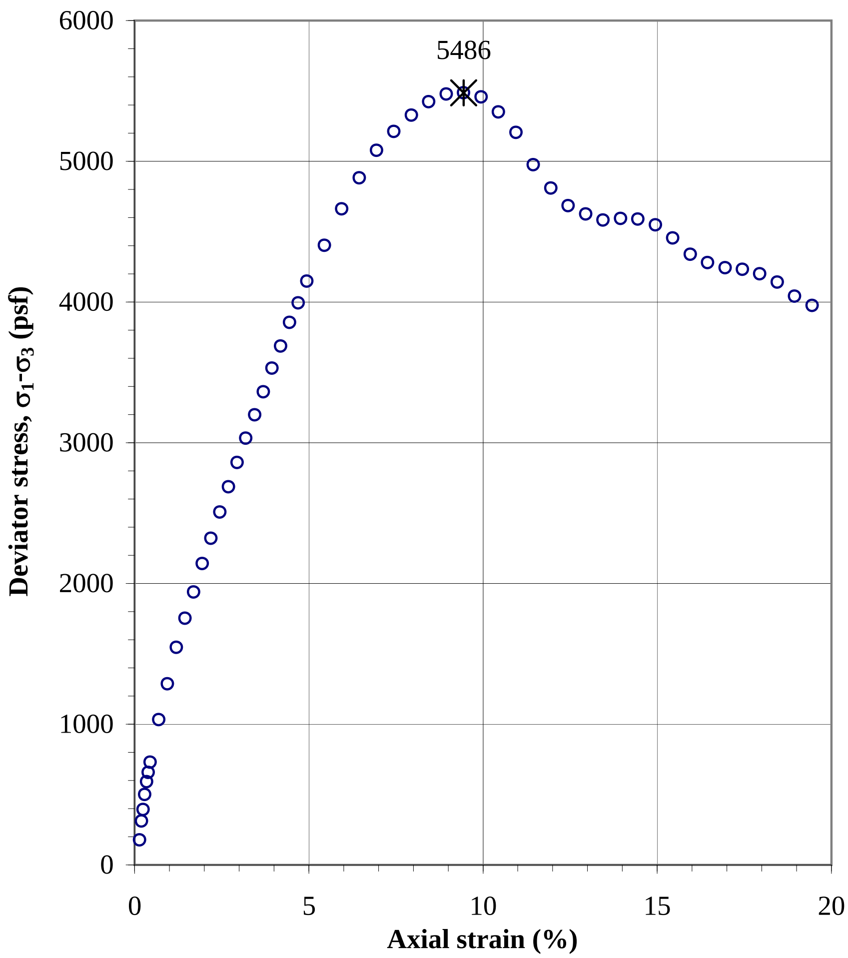
Boring No.: B-12
Sample:
Depth: 5'
Sample Description: Brown clay
Sample type: Undisturbed

Specific gravity, Gs	2.72	Assumed
Sample height, H (in.)	4.846	
Sample diameter, D (in.)	2.408	
Sample volume, V (ft^3)	0.0128	
Wt. rings + wet soil (g)	722.85	
Wt. rings/tare (g)	0.00	
Moist soil, Ws (g)	722.85	
Moist unit wt., γ_m (pcf)	124.8	
Dry unit wt., γ_d (pcf)	**98.5**	
Saturation (%)	100.0	
Void ratio, *e*	0.73	



Wet soil + tare (g)	676.98
Dry soil + tare (g)	566.60
Tare (g)	153.63
Water content, w (%)	**26.7**
Confining stress, σ_3 (psf)	360
Shear rate (in/min)	0.0145
Strain at failure, ε_f (%)	9.45
Deviator stress at failure, $(\sigma_1-\sigma_3)_f$ (psf)	5486
Shear stress at failure, $q_f = (\sigma_1-\sigma_3)_f/2$ (psf)	2743

Axial Strain (%)	σ_d $\sigma_1-\sigma_3$ (psf)	Q 1/2 σ_d (psf)
0.15	178.1	89.0
0.20	310.4	155.2
0.25	392.8	196.4
0.30	500.0	250.0
0.35	590.6	295.3
0.40	656.2	328.1
0.45	730.0	365.0
0.70	1032.1	516.0
0.95	1287.3	643.6
1.20	1545.4	772.7
1.45	1753.0	876.5
1.70	1939.1	969.5
1.95	2140.5	1070.2
2.20	2320.5	1160.2
2.45	2507.8	1253.9
2.70	2685.8	1342.9
2.95	2859.0	1429.5
3.20	3031.2	1515.6
3.45	3198.4	1599.2
3.70	3360.8	1680.4
3.95	3530.1	1765.0
4.20	3686.8	1843.4
4.45	3854.3	1927.1
4.70	3993.2	1996.6
4.95	4147.2	2073.6
5.45	4401.4	2200.7
5.95	4660.6	2330.3
6.45	4881.5	2440.7
6.95	5076.8	2538.4
7.45	5212.0	2606.0
7.95	5326.2	2663.1
8.45	5423.8	2711.9
8.95	5478.1	2739.0
9.45	5486.5	2743.2
9.95	5457.1	2728.5
10.45	5349.4	2674.7
10.95	5205.6	2602.8
11.45	4974.9	2487.4
11.95	4808.5	2404.2
12.45	4683.6	2341.8
12.95	4624.9	2312.4
13.45	4580.8	2290.4
13.95	4594.2	2297.1
14.45	4589.3	2294.6
14.95	4548.7	2274.3
15.45	4455.6	2227.8
15.95	4338.9	2169.4
16.45	4278.7	2139.3
16.95	4243.0	2121.5
17.45	4231.5	2115.7
17.95	4199.2	2099.6
18.45	4139.9	2069.9
18.95	4040.6	2020.3
19.45	3975.5	1987.7
19.87	3938.8	1969.4



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Reviewed:___________

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

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Project: Logan WWTP
No: 00823-012
Location: Logan, Utah
Date: 2/19/2013
By: JDF

Boring No.: B-01
Sample:
Depth: 34.5'
Sample Description: Brown sand
Sample type: Undisturbed-trimmed from ring

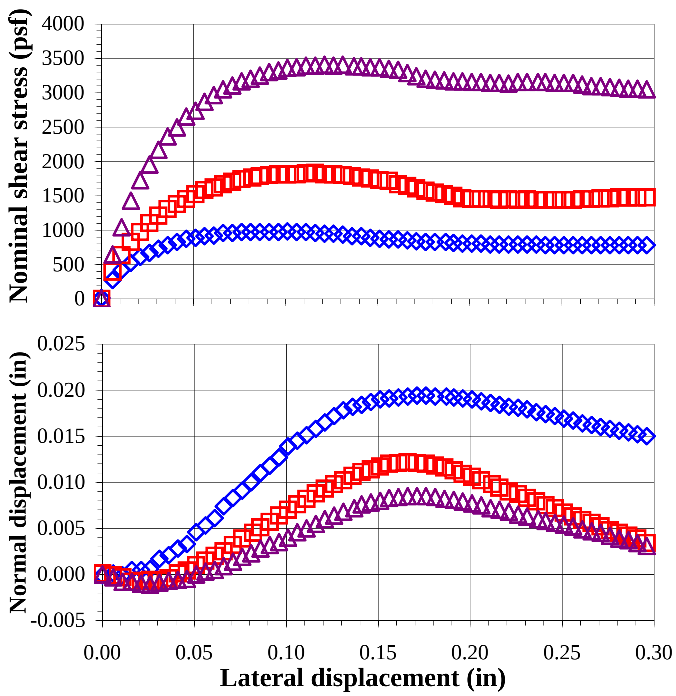
Test type: Inundated
Lateral displacement (in.): 0.3
Shear rate (in./min): 0.0200
Specific gravity, Gs: 2.70 Assumed

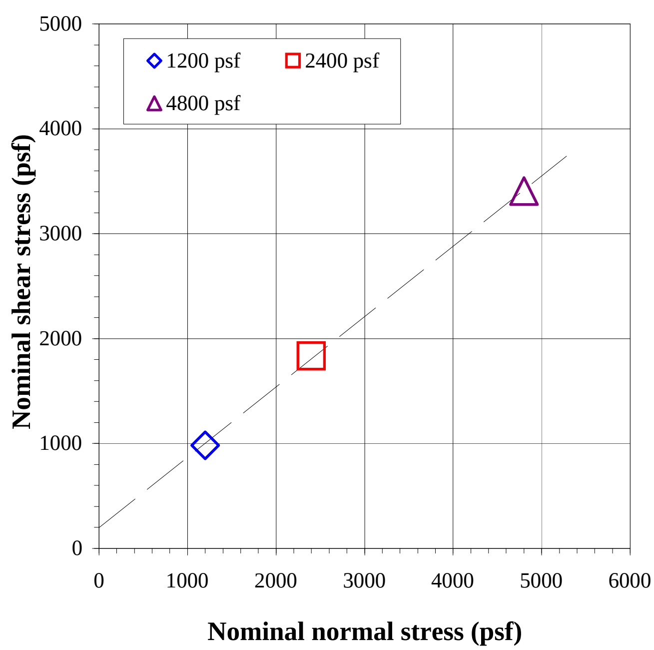
	Sample 1		Sample 2		Sample 3	
Nominal normal stress (psf)	1200		2400		4800	
Peak shear stress (psf)	984		1836		3408	
Lateral displacement at peak (in)	0.101		0.116		0.121	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Sample height (in)	1.0000	0.9908	1.0000	0.9838	1.0000	0.9660
Sample diameter (in)	2.416	2.416	2.416	2.416	2.416	2.416
Wt. rings + wet soil (g)	515.33	514.63	514.43	513.70	514.08	512.13
Wt. rings (g)	363.25	363.25	363.35	363.35	363.24	363.24
Wet soil + tare (g)	442.62	170.84	442.62	165.27	442.62	167.40
Dry soil + tare (g)	385.63	140.71	385.63	136.10	385.63	138.40
Tare (g)	151.47	22.23	151.47	20.91	151.47	21.30
Water content (%)	24.3	23.8	24.3	23.7	24.3	22.7
Dry unit weight (pcf)	101.6	102.5	101.0	102.6	100.8	104.3
Void ratio, e, for assumed Gs	0.66	0.64	0.67	0.64	0.67	0.61
Saturation (%)*	100.0	100.0	98.4	100.0	98.0	100.0

ϕ' (deg)	34
c' (psf)	198

Average of 3 samples	Initial	Pre-shear
Water content (%)	24.3	23.4
Dry unit weight (pcf)	101.1	103.1

*Pre-shear saturation set to 100% for phase calculations





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Nominal normal stress = 1200 psf			Nominal normal stress = 2400 psf			Nominal normal stress = 4800 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0	12	-0.0001	0	0	0.0001	0	0	0.0000
0.006	276	0.0001	0.006	396	-0.0001	0.006	648	-0.0003
0.011	420	-0.0001	0.011	636	-0.0003	0.011	1044	-0.0008
0.016	528	0.0005	0.016	828	-0.0008	0.016	1428	-0.0008
0.021	612	0.0005	0.021	972	-0.0007	0.021	1728	-0.0010
0.026	672	0.0006	0.026	1104	-0.0006	0.026	1956	-0.0011
0.031	732	0.0017	0.031	1212	-0.0007	0.031	2172	-0.0009
0.036	780	0.0021	0.036	1308	-0.0004	0.036	2364	-0.0007
0.041	828	0.0028	0.041	1380	0.0001	0.041	2496	-0.0006
0.046	876	0.0033	0.046	1452	0.0004	0.046	2652	-0.0005
0.051	888	0.0046	0.051	1524	0.0010	0.051	2736	0.0000
0.056	912	0.0053	0.056	1584	0.0015	0.056	2868	0.0003
0.061	924	0.0061	0.061	1620	0.0020	0.061	2964	0.0005
0.066	960	0.0074	0.066	1668	0.0025	0.066	3048	0.0009
0.071	960	0.0083	0.071	1704	0.0032	0.071	3108	0.0014
0.076	972	0.0091	0.076	1740	0.0039	0.076	3168	0.0019
0.081	972	0.0100	0.082	1764	0.0045	0.081	3204	0.0023
0.086	972	0.0110	0.086	1788	0.0051	0.086	3252	0.0028
0.091	972	0.0118	0.091	1800	0.0057	0.091	3300	0.0032
0.096	972	0.0127	0.096	1812	0.0064	0.096	3324	0.0035
0.101	984	0.0139	0.101	1812	0.0070	0.101	3360	0.0040
0.106	972	0.0145	0.106	1812	0.0076	0.106	3372	0.0046
0.111	972	0.0151	0.111	1824	0.0082	0.111	3396	0.0050
0.116	960	0.0158	0.116	1836	0.0088	0.116	3396	0.0055
0.121	948	0.0165	0.121	1812	0.0093	0.121	3408	0.0060
0.126	948	0.0172	0.126	1812	0.0098	0.126	3396	0.0064
0.131	936	0.0178	0.131	1800	0.0102	0.131	3408	0.0068
0.136	912	0.0182	0.136	1788	0.0107	0.137	3384	0.0072
0.141	912	0.0184	0.141	1764	0.0111	0.141	3384	0.0076
0.146	888	0.0187	0.146	1752	0.0114	0.146	3372	0.0078
0.151	876	0.0190	0.151	1728	0.0117	0.151	3372	0.0080
0.156	864	0.0191	0.156	1716	0.0120	0.156	3348	0.0083
0.161	864	0.0192	0.161	1668	0.0121	0.161	3336	0.0084
0.166	852	0.0193	0.166	1644	0.0122	0.166	3288	0.0085
0.171	840	0.0194	0.171	1608	0.0121	0.171	3240	0.0085
0.176	828	0.0194	0.176	1572	0.0120	0.176	3204	0.0085
0.181	828	0.0193	0.181	1548	0.0118	0.181	3192	0.0084
0.187	828	0.0193	0.186	1524	0.0116	0.186	3180	0.0082
0.191	816	0.0192	0.191	1500	0.0113	0.191	3168	0.0081
0.196	804	0.0191	0.196	1464	0.0109	0.196	3168	0.0079
0.201	804	0.0190	0.201	1452	0.0106	0.201	3156	0.0077
0.206	804	0.0188	0.206	1452	0.0102	0.206	3156	0.0075
0.211	792	0.0186	0.212	1452	0.0098	0.211	3144	0.0072
0.216	792	0.0184	0.216	1440	0.0094	0.216	3144	0.0070
0.221	792	0.0182	0.221	1452	0.0090	0.221	3132	0.0068
0.226	792	0.0181	0.226	1440	0.0087	0.226	3156	0.0065
0.231	792	0.0179	0.231	1452	0.0083	0.231	3156	0.0063
0.236	792	0.0176	0.236	1440	0.0079	0.237	3156	0.0060
0.241	780	0.0174	0.241	1440	0.0075	0.241	3156	0.0058
0.246	780	0.0172	0.246	1440	0.0072	0.246	3144	0.0056
0.251	780	0.0169	0.251	1440	0.0067	0.251	3144	0.0054
0.256	780	0.0167	0.256	1440	0.0063	0.256	3144	0.0052
0.261	780	0.0164	0.261	1452	0.0059	0.261	3120	0.0049
0.266	780	0.0162	0.266	1452	0.0056	0.266	3096	0.0047
0.271	780	0.0160	0.271	1464	0.0052	0.271	3096	0.0045
0.276	780	0.0158	0.276	1464	0.0048	0.276	3084	0.0042
0.281	780	0.0156	0.281	1476	0.0045	0.281	3072	0.0039
0.286	780	0.0154	0.286	1476	0.0042	0.286	3060	0.0037
0.291	780	0.0152	0.291	1476	0.0039	0.291	3060	0.0034
0.296	780	0.0150	0.296	1476	0.0034	0.296	3048	0.0031
0.301	780	0.0148	0.301	1476	0.0031	0.301	3036	0.0028

Minimum Laboratory Soil Resistivity, pH of Soil for Use in Corrosion Testing, and Ions in Water by Chemically Suppressed Ion Chromatography *(AASHTO T 288, T 289, ASTM D4327, and C1580)*

Project: **Logan WWTP**
No: **00823-012 (II)**
Location: Logan, UT
Date: 5/9/2013
By: BRR

Sample info.	Boring No.	B-02		B-05		B-07			
	Sample								
	Depth	39.5'		49.5'		5'			
Water content data	Wet soil + tare (g)	90.08		68.65		62.36			
	Dry soil + tare (g)	84.73		65.44		59.78			
	Tare (g)	37.47		37.80		37.85			
	Water content (%)	11.3		11.6		11.8			
Chem. data	pH	7.4		8.0		9.4			
	Soluble chloride* (ppm)	<6.20		<6.43		21.3			
	Soluble sulfate** (ppm)	47.1		26.3		112			
Resistivity data		Soil condition (%)	Resistivity (Ω-cm)	Soil condition (%)	Resistivity (Ω-cm)	Soil condition (%)	Resistivity (Ω-cm)	Soil condition (%)	Resistivity (Ω-cm)
		As Is	16000	As Is	5900	As Is	8000		
		+3	6000	+3	4000	+3	6000		
		+6	2700	+6	3000	+6	2400		
		+9	2000	+9	2200	+9	1600		
		+12	1800	+12	2100	+12	920		
		+15	1900	+15	2100	+15	680		
						+18	600		
						+21	550		
						+24	570		
	Minimum resistivity (Ω-cm)	**1800**		**2100**		**550**			

* Performed by AWAL using EPA 300.0

** Performed by AWAL using ASTM C1580

Entered by:___________

Reviewed:___________

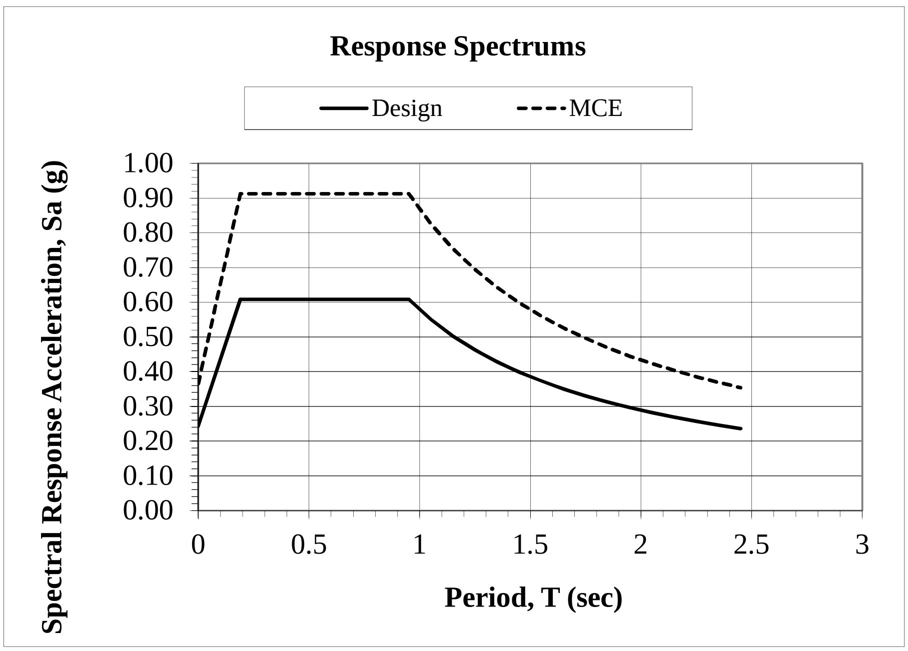
APPENDIX C

SITE GROUND MOTION [IBC SECTION 1615]

Project: CWSID BDO
Latitude = 41.738244
Longitude = -111.897002

Number: 00414-006
Date: 4/30/12
By: JMG

Ss =	1.014 (g)	The mapped spectral accleration for short periods	[1615.1]
S_1 =	0.318 (g)	The mapped spectral accleration for a 1-second period	
Site Class =	E	Table 16.15.1.1	
Fa =	0.90	Table 1615.1.2(1)	
Fv =	2.73	Table 1615.1.2(2)	
S_{MS} =	0.913	S_{MS} = Fa*Ss	*The maximum considered E.Q. spectral resonse accelerations
S_{M1} =	0.868	S_{M1} = Fv*S_1	for short and 1-second periods [1615.1.2]
MCE/PGA =	**0.365**	**0.4*S_{MS} [Equation 16-42 in accordance with 1802.2.7 and 1615.2.1]**	
S_{DS} =	0.608	S_{DS} = 2/3*S_{MS}	*The design spectral response acceleration
S_{D1} =	0.578	S_{D1} = 2/3*S_{M1}	at short and 1-second periods
T_0 =	0.190	T_0 = 0.2*S_{D1}/S_{DS}	
T_s =	0.951	T_s = S_{D1}/S_{DS}	
ΔT =	0.1	Time step for diagram	



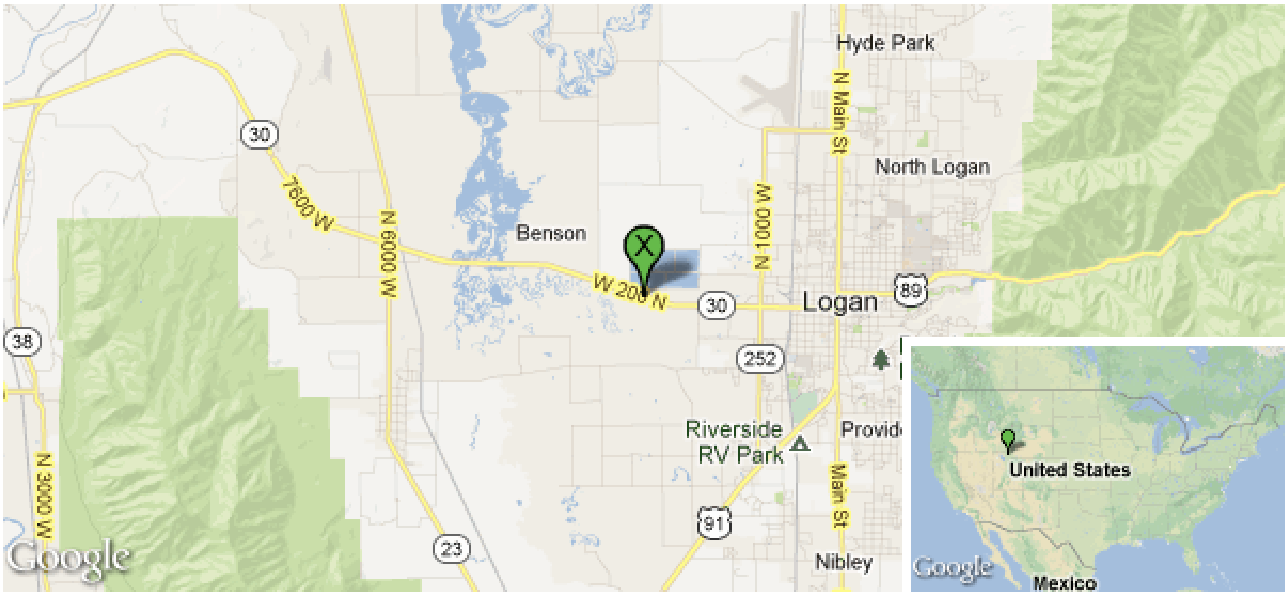
T (sec)	Sa (g)	Sa (MCE) (g)
0	0.24	0.37
0.19	0.61	0.91
0.95	0.61	0.91
1.05	0.55	0.83
1.15	0.50	0.75
1.25	0.46	0.69
1.35	0.43	0.64
1.45	0.40	0.60
1.55	0.37	0.56
1.65	0.35	0.53
1.75	0.33	0.50
1.85	0.31	0.47
1.95	0.30	0.44
2.05	0.28	0.42
2.15	0.27	0.40
2.25	0.26	0.39
2.35	0.25	0.37
2.45	0.24	0.35

IGES®

USGS Design Maps Summary Report

User–Specified Input

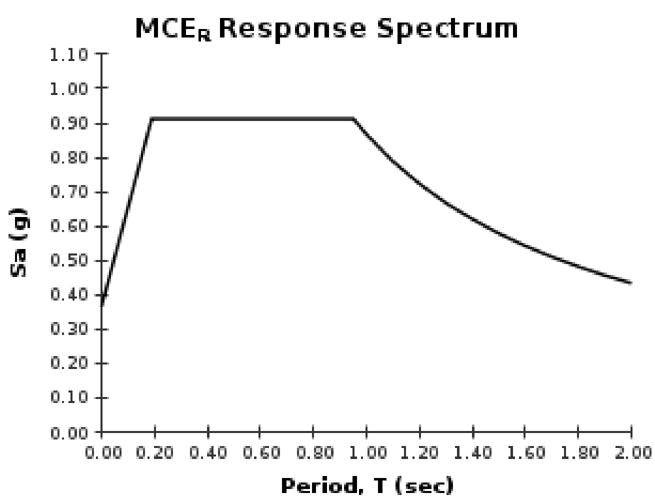
Report Title	Logan WWTP Thu May 16, 2013 18:25:02 UTC
Building Code Reference Document	2012 International Building Code (which makes use of 2008 USGS hazard data)
Site Coordinates	41.73824°N, 111.897°W
Site Soil Classification	Site Class E – "Soft Clay Soil"
Risk Category	IV (e.g. essential facilities)

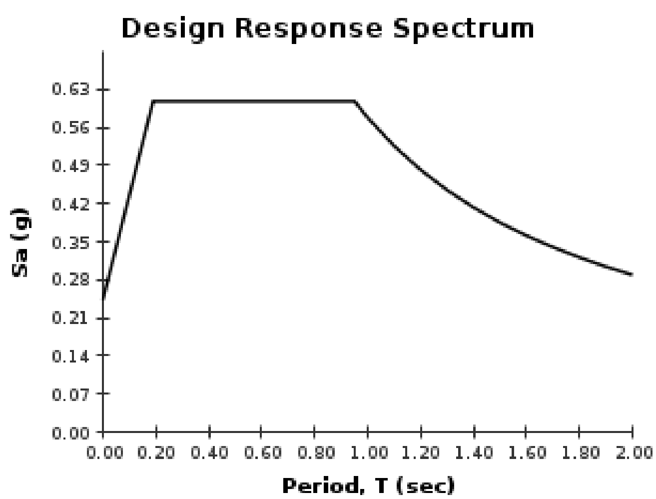


USGS–Provided Output

$S_S =$ 1.014 g	$S_{MS} =$ 0.912 g	$S_{DS} =$ 0.608 g
$S_1 =$ 0.318 g	$S_{M1} =$ 0.867 g	$S_{D1} =$ 0.578 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.

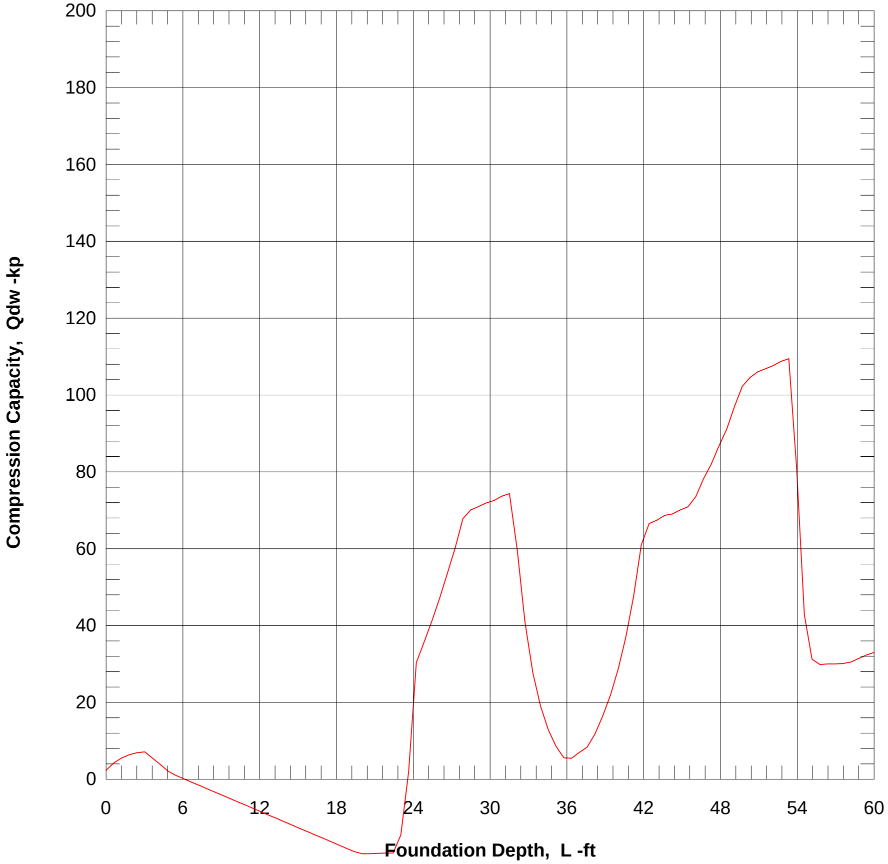


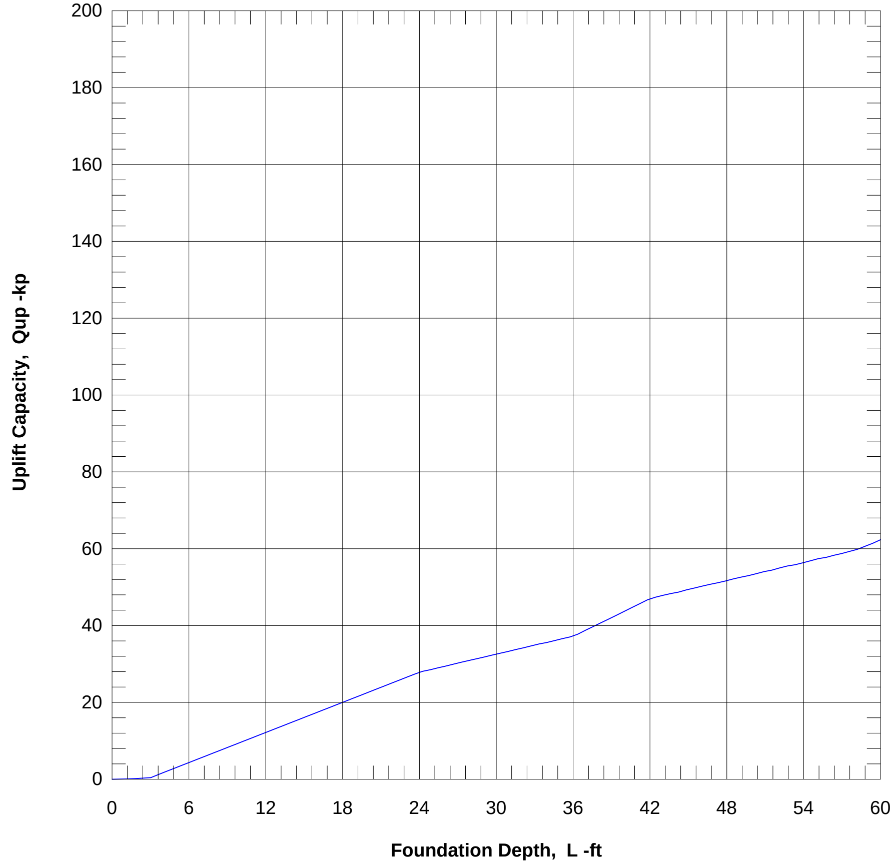


Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter

APPENDIX D

ALLOWABLE CAPACITY vs FOUNDATION DEPTH





Logan WWTP

Figure D-1

Downward and Uplift Capacity vs Pile Length

The results are for single section pile. Multiple sections may not be correct!
****

Length -ft	Qtip -kp	Qside -kp	Q_dw -kp	Qd_alw -kp	Weight -kp	Qsid* -kp	Q_up -kp	Qu_alw -kp
0.00	3.76	0.00	3.8	2.35	0.00	0.00	0.00	0.00
0.61	6.85	-0.03	6.8	4.26	0.02	0.02	0.04	0.04
1.21	8.98	-0.13	8.8	5.53	0.05	0.08	0.13	0.09
1.82	10.47	-0.30	10.2	6.36	0.07	0.18	0.25	0.17
2.42	11.59	-0.54	11.0	6.90	0.10	0.31	0.41	0.27
3.03	12.26	-0.88	11.4	7.11	0.12	0.54	0.66	0.42
3.64	11.05	-2.29	8.8	5.48	0.15	1.95	2.10	1.23
4.24	9.83	-3.69	6.1	3.83	0.17	3.35	3.52	2.03
4.85	8.41	-5.09	3.3	2.08	0.20	4.75	4.95	2.84
5.45	8.06	-6.47	1.6	0.99	0.22	6.13	6.35	3.63
6.06	8.06	-7.84	0.2	0.14	0.25	7.50	7.74	4.41
6.67	8.06	-9.23	-1.2	-0.73	0.27	8.89	9.16	5.21
7.27	8.06	-10.62	-2.6	-1.60	0.30	10.28	10.58	6.01
7.88	8.06	-11.98	-3.9	-2.45	0.32	11.63	11.96	6.79
8.48	8.06	-13.37	-5.3	-3.32	0.35	13.03	13.37	7.59
9.09	8.06	-14.76	-6.7	-4.19	0.37	14.42	14.79	8.38
9.70	8.06	-16.13	-8.1	-5.04	0.40	15.79	16.18	9.17
10.30	8.06	-17.51	-9.4	-5.91	0.42	17.16	17.58	9.96
10.91	8.06	-18.89	-10.8	-6.77	0.45	18.54	18.99	10.75
11.52	8.06	-20.26	-12.2	-7.62	0.47	19.91	20.38	11.53
12.12	8.06	-21.66	-13.6	-8.50	0.50	21.31	21.81	12.34
12.73	8.06	-23.04	-15.0	-9.36	0.52	22.70	23.22	13.13
13.33	8.06	-24.41	-16.3	-10.22	0.55	24.06	24.61	13.91
13.94	8.06	-25.79	-17.7	-11.08	0.57	25.45	26.02	14.71
14.55	8.06	-27.20	-19.1	-11.96	0.60	26.86	27.45	15.52
15.15	8.06	-28.58	-20.5	-12.82	0.62	28.23	28.85	16.31
15.76	8.06	-29.91	-21.9	-13.66	0.65	29.56	30.21	17.07
16.36	8.06	-31.32	-23.3	-14.54	0.67	30.97	31.64	17.88
16.97	8.06	-32.69	-24.6	-15.39	0.70	32.34	33.03	18.66
17.58	8.06	-34.06	-26.0	-16.25	0.72	33.71	34.43	19.45
18.18	8.06	-35.45	-27.4	-17.12	0.75	35.10	35.85	20.25
18.79	8.06	-36.86	-28.8	-18.00	0.77	36.51	37.28	21.05
19.39	8.06	-38.20	-30.1	-18.84	0.80	37.85	38.65	21.82
20.00	8.60	-39.63	-31.0	-19.39	0.82	39.28	40.10	22.64
20.61	10.00	-41.00	-31.0	-19.37	0.84	40.65	41.50	23.43
21.21	11.54	-42.37	-30.8	-19.27	0.87	42.02	42.89	24.22
21.82	12.99	-43.76	-30.8	-19.23	0.89	43.41	44.30	25.01
22.42	14.41	-45.15	-30.7	-19.21	0.92	44.80	45.72	25.81
23.03	23.28	-46.47	-23.2	-14.49	0.94	46.11	47.06	26.56
23.64	51.06	-47.88	3.2	1.99	0.97	47.52	48.49	27.37
24.24	96.99	-48.40	48.6	30.37	0.99	48.76	49.75	28.08
24.85	103.96	-46.76	57.2	35.75	1.02	49.47	50.49	28.50
25.45	111.42	-45.54	65.9	41.17	1.04	50.36	51.40	29.02
26.06	119.56	-44.11	75.4	47.16	1.07	51.12	52.19	29.47
26.67	128.56	-42.81	85.8	53.59	1.09	51.92	53.02	29.94
27.27	137.91	-41.50	96.4	60.25	1.12	52.80	53.92	30.45
27.88	148.50	-39.98	108.5	67.82	1.14	53.57	54.72	30.91
28.48	150.76	-38.61	112.1	70.09	1.17	54.37	55.54	31.38
29.09	150.70	-37.16	113.5	70.96	1.19	55.15	56.35	31.83
29.70	150.91	-35.86	115.0	71.90	1.22	55.99	57.21	32.32
30.30	150.59	-34.53	116.1	72.54	1.24	56.78	58.02	32.79
30.91	150.90	-33.05	117.9	73.66	1.27	57.60	58.86	33.26
31.52	150.75	-31.82	118.9	74.33	1.29	58.43	59.72	33.75
32.12	125.54	-30.19	95.3	59.59	1.32	59.21	60.52	34.21
32.73	94.19	-28.79	65.4	40.87	1.34	60.03	61.37	34.69
33.33	72.03	-27.64	44.4	27.75	1.37	60.89	62.26	35.19

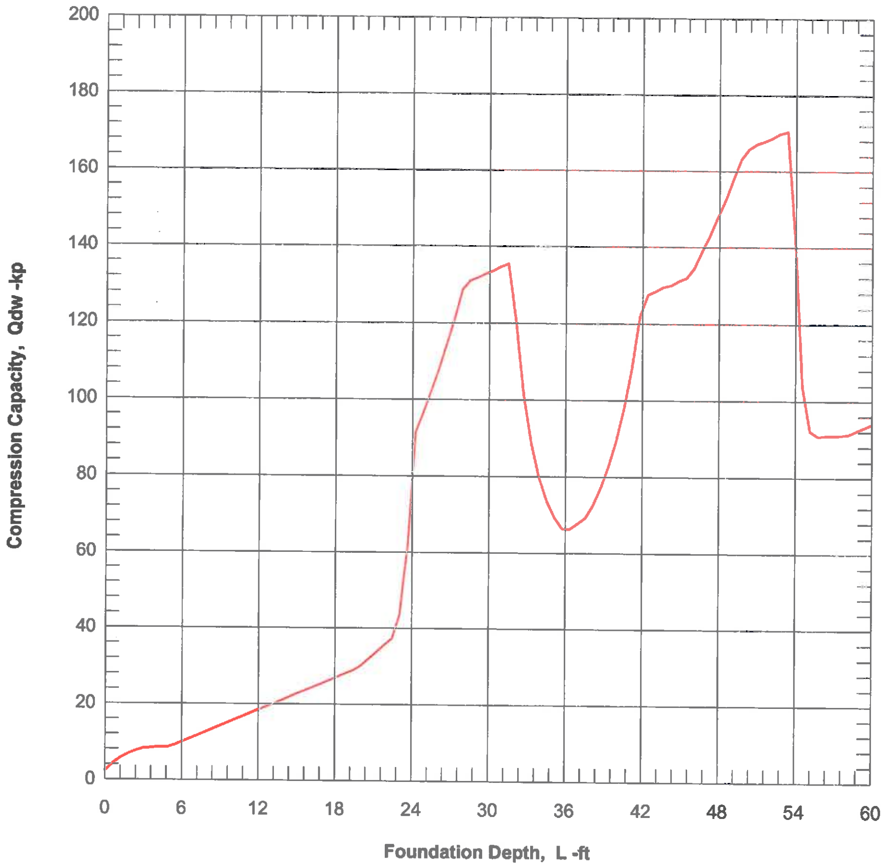
33.94	56.50	-25.96	30.5	19.09	1.39	61.57	62.96	35.60
34.55	45.24	-24.70	20.5	12.84	1.42	62.39	63.81	36.08
35.15	37.08	-23.34	13.7	8.58	1.44	63.23	64.67	36.57
35.76	30.89	-21.93	9.0	5.60	1.47	64.06	65.52	37.05
36.36	28.88	-20.16	8.7	5.45	1.49	65.28	66.77	37.76
36.97	28.84	-17.63	11.2	7.01	1.52	67.09	68.61	38.79
37.58	28.87	-15.51	13.4	8.35	1.54	68.81	70.35	39.77
38.18	31.90	-13.08	18.8	11.76	1.57	70.50	72.07	40.73
38.79	37.03	-10.83	26.2	16.37	1.59	72.24	73.83	41.73
39.39	43.62	-8.64	35.0	21.86	1.62	73.97	75.58	42.71
40.00	51.98	-6.27	45.7	28.56	1.64	75.73	77.37	43.71
40.61	62.93	-3.84	59.1	36.93	1.66	77.50	79.16	44.72
41.21	77.66	-1.48	76.2	47.61	1.69	79.26	80.94	45.72
41.82	97.04	0.54	97.6	60.99	1.71	80.99	82.70	46.71
42.42	104.12	2.36	106.5	66.55	1.74	82.11	83.85	47.35
43.03	104.15	3.69	107.8	67.40	1.76	83.01	84.77	47.88
43.64	104.49	5.34	109.8	68.65	1.79	83.80	85.59	48.35
44.24	104.07	6.41	110.5	69.05	1.81	84.43	86.25	48.72
44.85	104.31	7.83	112.1	70.09	1.84	85.40	87.24	49.28
45.45	104.17	9.23	113.4	70.88	1.86	86.22	88.08	49.76
46.06	107.00	10.57	117.6	73.48	1.89	87.03	88.92	50.24
46.67	112.50	12.48	125.0	78.11	1.91	87.87	89.78	50.73
47.27	117.88	13.35	131.2	82.02	1.94	88.57	90.51	51.14
47.88	123.98	14.73	138.7	86.70	1.96	89.33	91.29	51.59
48.48	129.91	15.90	145.8	91.13	1.99	90.28	92.26	52.14
49.09	137.13	17.97	155.1	96.94	2.01	91.02	93.03	52.58
49.70	144.23	19.41	163.6	102.27	2.04	91.72	93.76	52.99
50.30	147.31	19.98	167.3	104.55	2.06	92.55	94.62	53.48
50.91	147.85	21.83	169.7	106.05	2.09	93.52	95.60	54.04
51.52	147.68	23.27	170.9	106.84	2.11	94.14	96.25	54.41
52.12	147.55	24.72	172.3	107.67	2.14	95.13	97.27	54.99
52.73	147.98	26.00	174.0	108.74	2.16	95.99	98.16	55.49
53.33	147.69	27.46	175.1	109.47	2.19	96.56	98.74	55.83
53.94	102.02	28.31	130.3	81.46	2.21	97.45	99.66	56.35
54.55	38.33	30.25	68.6	42.86	2.24	98.31	100.55	56.85
55.15	18.27	31.73	50.0	31.25	2.26	99.29	101.55	57.42
55.76	14.95	32.89	47.8	29.90	2.29	99.84	102.13	57.75
56.36	13.64	34.38	48.0	30.01	2.31	100.79	103.10	58.30
56.97	12.32	35.69	48.0	30.01	2.34	101.53	103.86	58.74
57.58	10.99	37.21	48.2	30.13	2.36	102.45	104.81	59.28
58.18	10.06	38.74	48.8	30.50	2.39	103.40	105.79	59.83
58.79	10.06	40.20	50.3	31.41	2.41	104.79	107.20	60.63
59.39	10.06	41.67	51.7	32.33	2.44	106.17	108.61	61.42
60.00	10.06	42.75	52.8	33.00	2.46	107.76	110.22	62.33

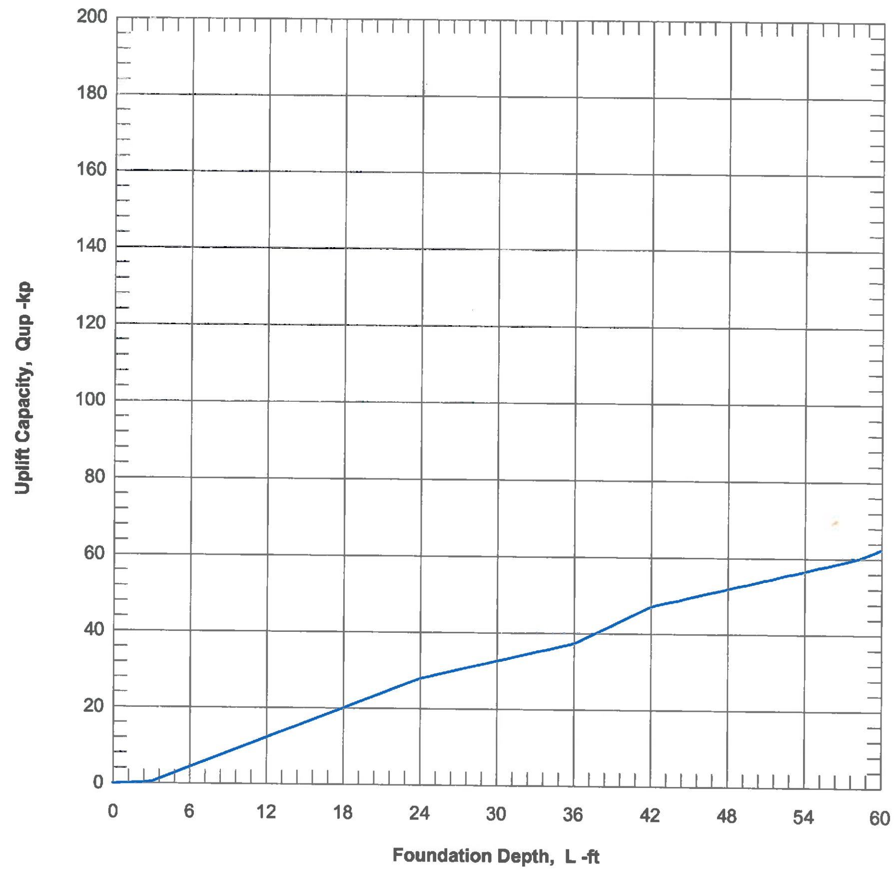
FACTOR OF SAFETY:

FSside	FStip	FSup	FSweight
1.6	1.6	1.8	1.0

Note: Data can be selected, copied and pasted to Excel to create graphics
Length - Pile length, distance from pile top to tip (not from ground surface)
Qtip - Ultimate pile tip resistance
Qside - Ultimate pile side resistance
Q_dw - Ultimate pile downward resistance
Qd_alw - Allowable pile downward resistance
Weight - Weight of pile shaft
Qsid* - Ultimate pile side uplift resistance
Q_up - Ultimate pile uplift resistance
Qu_alw - Allowable pile uplift resistance

ALLOWABLE CAPACITY vs FOUNDATION DEPTH





CivilTech Software

Logan WWTP

Figure D-2

Downward and Uplift Capacity vs Pile Length

The results are for single section pile. Multiple sections may not be correct!
****

Length -ft	Qtip -kp	Qside -kp	Q_dw -kp	Qd_alw -kp	Weight -kp	Qsid* -kp	Q_up -kp	Qu_alw -kp
0.00	3.76	0.00	3.8	2.35	0.00	0.00	0.00	0.00
0.61	6.85	0.03	6.9	4.30	0.02	0.02	0.04	0.04
1.21	8.98	0.13	9.1	5.70	0.05	0.08	0.13	0.09
1.82	10.47	0.30	10.8	6.73	0.07	0.18	0.25	0.17
2.42	11.59	0.54	12.1	7.58	0.10	0.31	0.41	0.27
3.03	12.26	0.88	13.1	8.22	0.12	0.54	0.66	0.42
3.64	11.05	2.29	13.3	8.34	0.15	1.95	2.10	1.23
4.24	9.83	3.69	13.5	8.45	0.17	3.35	3.52	2.03
4.85	8.41	5.09	13.5	8.44	0.20	4.75	4.95	2.84
5.45	8.06	6.47	14.5	9.08	0.22	6.13	6.35	3.63
6.06	8.06	7.84	15.9	9.94	0.25	7.50	7.74	4.41
6.67	8.06	9.23	17.3	10.81	0.27	8.89	9.16	5.21
7.27	8.06	10.62	18.7	11.68	0.30	10.28	10.58	6.01
7.88	8.06	11.98	20.0	12.53	0.32	11.63	11.96	6.79
8.48	8.06	13.37	21.4	13.40	0.35	13.03	13.37	7.59
9.09	8.06	14.76	22.8	14.26	0.37	14.42	14.79	8.38
9.70	8.06	16.13	24.2	15.12	0.40	15.79	16.18	9.17
10.30	8.06	17.51	25.6	15.98	0.42	17.16	17.58	9.96
10.91	8.06	18.89	26.9	16.84	0.45	18.54	18.99	10.75
11.52	8.06	20.26	28.3	17.70	0.47	19.91	20.38	11.53
12.12	8.06	21.66	29.7	18.57	0.50	21.31	21.81	12.34
12.73	8.06	23.04	31.1	19.44	0.52	22.70	23.22	13.13
13.33	8.06	24.41	32.5	20.29	0.55	24.06	24.61	13.91
13.94	8.06	25.79	33.9	21.16	0.57	25.45	26.02	14.71
14.55	8.06	27.20	35.3	22.04	0.60	26.86	27.45	15.52
15.15	8.06	28.58	36.6	22.90	0.62	28.23	28.85	16.31
15.76	8.06	29.91	38.0	23.73	0.65	29.56	30.21	17.07
16.36	8.06	31.32	39.4	24.61	0.67	30.97	31.64	17.88
16.97	8.06	32.69	40.7	25.47	0.70	32.34	33.03	18.66
17.58	8.06	34.06	42.1	26.33	0.72	33.71	34.43	19.45
18.18	8.06	35.45	43.5	27.20	0.75	35.10	35.85	20.25
18.79	8.06	36.86	44.9	28.07	0.77	36.51	37.28	21.05
19.39	8.06	38.20	46.3	28.92	0.80	37.85	38.65	21.82
20.00	8.60	39.63	48.2	30.14	0.82	39.28	40.10	22.64
20.61	10.00	41.00	51.0	31.88	0.84	40.65	41.50	23.43
21.21	11.54	42.37	53.9	33.69	0.87	42.02	42.89	24.22
21.82	12.99	43.76	56.7	35.47	0.89	43.41	44.30	25.01
22.42	14.41	45.15	59.6	37.23	0.92	44.80	45.72	25.81
23.03	23.28	46.47	69.7	43.59	0.94	46.11	47.06	26.56
23.64	51.06	47.87	98.9	61.83	0.97	47.52	48.49	27.37
24.24	96.99	49.29	146.3	91.42	0.99	48.76	49.75	28.08
24.85	103.96	50.63	154.6	96.62	1.02	49.47	50.49	28.50
25.45	111.42	52.06	163.5	102.18	1.04	50.36	51.40	29.02
26.06	119.56	53.41	173.0	108.11	1.07	51.12	52.19	29.47
26.67	128.56	54.77	183.3	114.58	1.09	51.92	53.02	29.94
27.27	137.91	56.21	194.1	121.32	1.12	52.80	53.92	30.45
27.88	148.50	57.59	206.1	128.80	1.14	53.57	54.72	30.91
28.48	150.76	58.96	209.7	131.07	1.17	54.37	55.54	31.38
29.09	150.70	60.33	211.0	131.90	1.19	55.15	56.35	31.83
29.70	150.91	61.73	212.6	132.90	1.22	55.99	57.21	32.32
30.30	150.59	63.08	213.7	133.55	1.24	56.78	58.02	32.79
30.91	150.90	64.50	215.4	134.63	1.27	57.60	58.86	33.26
31.52	150.75	65.88	216.6	135.39	1.29	58.43	59.72	33.75
32.12	125.54	67.28	192.8	120.51	1.32	59.21	60.52	34.21
32.73	94.19	68.69	162.9	101.80	1.34	60.03	61.37	34.69
33.33	72.03	70.08	142.1	88.82	1.37	60.89	62.26	35.19

33.94	56.50	71.39	127.9	79.93	1.39	61.57	62.96	35.60
34.55	45.24	72.76	118.0	73.75	1.42	62.39	63.81	36.08
35.15	37.08	74.17	111.2	69.53	1.44	63.23	64.67	36.57
35.76	30.89	75.58	106.5	66.55	1.47	64.06	65.52	37.05
36.36	28.88	77.37	106.2	66.40	1.49	65.28	66.77	37.76
36.97	28.84	79.78	108.6	67.89	1.52	67.09	68.61	38.79
37.58	28.87	82.07	110.9	69.33	1.54	68.81	70.35	39.77
38.18	31.90	84.34	116.2	72.65	1.57	70.50	72.07	40.73
38.79	37.03	86.66	123.7	77.31	1.59	72.24	73.83	41.73
39.39	43.62	88.96	132.6	82.86	1.62	73.97	75.58	42.71
40.00	51.98	91.30	143.3	89.55	1.64	75.73	77.37	43.71
40.61	62.93	93.66	156.6	97.87	1.66	77.50	79.16	44.72
41.21	77.66	96.00	173.7	108.53	1.69	79.26	80.94	45.72
41.82	97.04	98.24	195.3	122.05	1.71	80.99	82.70	46.71
42.42	104.12	99.95	204.1	127.54	1.74	82.11	83.85	47.35
43.03	104.15	101.41	205.6	128.48	1.76	83.01	84.77	47.88
43.64	104.49	102.87	207.4	129.60	1.79	83.80	85.59	48.35
44.24	104.07	104.01	208.1	130.05	1.81	84.43	86.25	48.72
44.85	104.31	105.55	209.9	131.16	1.84	85.40	87.24	49.28
45.45	104.17	106.95	211.1	131.95	1.86	86.22	88.08	49.76
46.06	107.00	108.35	215.3	134.59	1.89	87.03	88.92	50.24
46.67	112.50	109.85	222.4	138.97	1.91	87.87	89.78	50.73
47.27	117.88	111.04	228.9	143.08	1.94	88.57	90.51	51.14
47.88	123.98	112.39	236.4	147.73	1.96	89.33	91.29	51.59
48.48	129.91	113.82	243.7	152.33	1.99	90.28	92.26	52.14
49.09	137.13	115.34	252.5	157.79	2.01	91.02	93.03	52.58
49.70	144.23	116.63	260.9	163.04	2.04	91.72	93.76	52.99
50.30	147.31	117.84	265.1	165.72	2.06	92.55	94.62	53.48
50.91	147.85	119.49	267.3	167.09	2.09	93.52	95.60	54.04
51.52	147.68	120.70	268.4	167.74	2.11	94.14	96.25	54.41
52.12	147.55	122.25	269.8	168.62	2.14	95.13	97.27	54.99
52.73	147.98	123.72	271.7	169.81	2.16	95.99	98.16	55.49
53.33	147.69	124.85	272.5	170.34	2.19	96.56	98.74	55.83
53.94	102.02	126.21	228.2	142.65	2.21	97.45	99.66	56.35
54.55	38.33	127.77	166.1	103.81	2.24	98.31	100.55	56.85
55.15	18.27	129.35	147.6	92.26	2.26	99.29	101.55	57.42
55.76	14.95	130.45	145.4	90.88	2.29	99.84	102.13	57.75
56.36	13.64	132.00	145.6	91.02	2.31	100.79	103.10	58.30
56.97	12.32	133.33	145.6	91.03	2.34	101.53	103.86	58.74
57.58	10.99	134.85	145.8	91.15	2.36	102.45	104.81	59.28
58.18	10.06	136.23	146.3	91.43	2.39	103.40	105.79	59.83
58.79	10.06	137.65	147.7	92.32	2.41	104.79	107.20	60.63
59.39	10.06	139.06	149.1	93.20	2.44	106.17	108.61	61.42
60.00	10.06	140.47	150.5	94.08	2.46	107.76	110.22	62.33

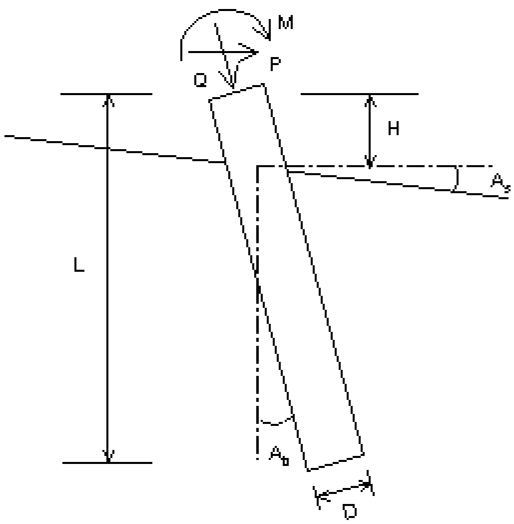
FACTOR OF SAFETY:

FSside	FStip	FSup	FSweight
1.6	1.6	1.8	1.0

Note: Data can be selected, copied and pasted to Excel to create graphics
Length - Pile length, distance from pile top to tip (not from ground surface)
Qtip - Ultimate pile tip resistance
Qside - Ultimate pile side resistance
Q_dw - Ultimate pile downward resistance
Qd_alw - Allowable pile downward resistance
Weight - Weight of pile shaft
Qsid* - Ultimate pile side uplift resistance
Q_up - Ultimate pile uplift resistance
Qu_alw - Allowable pile uplift resistance

VERTICAL ANALYSIS

Figure D-3



Driving Steel Pile (Closed end)

Loads:
Load Factor for Vertical Loads= 1.0
Load Factor for Lateral Loads= 1.0
Loads Supported by Pile Cap= 0 %
Shear Condition: Static

(with Load Factor)
Vertical Load, Q= 70.0 -kp
Shear Load, P= 10.0 -kp
Moment, M= 10.0 -kp-f

Profile:
Pile Length, L= 45.0 -ft
Top Height, H= 0 -ft
Slope Angle, As= 0
Batter Angle, Ab= 0

* Negative Friction *
Negative Friction Start: 0 -ft   End: 24 -ft   with Factor: 1

Soil Data:

Depth -ft	Gamma -lb/f3	Phi	C -kp/f2	K -lb/i3	e50 or Dr %	Nspt
0	125.6	39.1	0.00	219.4	76.49	41
3	69.9	0.0	2.25	708.4	0.61	18
5	64.3	0.0	1.01	227.3	0.99	8
24	59.0	36.4	0.00	67.2	53.92	20
28	61.8	38.7	0.00	113.6	72.35	37
36	64.3	29.0	0.51	227.3	0.99	8
42	59.7	37.0	0.00	76.1	57.91	23
50	61.7	38.6	0.00	112.0	71.77	36
58	66.9	0.0	1.26	317.7	0.87	10

Pile Data:

Depth -ft	Width -in	Area -in2	Per. -in	I -in4	E -kp/i2	Weight -kp/f
0.0	12.75	12.2	40.1	235.9	29000	0.041
45.0	12.75	127.7	40.1	235.9	29000	0.041

Vertical Capacity:
Weight above Ground= 0.00 Total Weight= 1.85-kp   *Soil Weight is not included
Side Resistance (Down)= 8.114-kp Side Resistance (Up)= 85.458-kp
Tip Resistance (Down)= 104.272-kp Tip Resistance (Up)= 0.000-kp
Total Ultimate Capacity (Down) Qult= 112.386-kp Total Ultimate Capacity (Up)= 87.303-kp
Total Allowable Capacity (Down) Qallow= 70.241-kp Total Allowable Capacity (Up) Qallow= 49.322-kp
OK! Qallow > Q

Settlement Calculation:
At Q= 70.00-kp Settlement= 0.20694-in
At Xallow= 1.00-in Qallow= 99999.00000-kp

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

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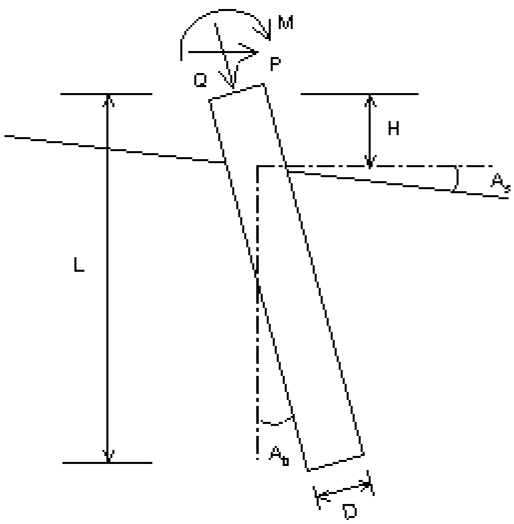
VERTICAL ANALYSIS

Figure D-4



Driving Steel Pile (Closed end)

Loads:
Load Factor for Vertical Loads= 1.0
Load Factor for Lateral Loads= 1.0
Loads Supported by Pile Cap= 0 %
Shear Condition: Static

(with Load Factor)
Vertical Load, Q= 70.0 -kp
Shear Load, P= 10.0 -kp
Moment, M= 10.0 -kp-f

Profile:
Pile Length, L= 35.0 -ft
Top Height, H= 0 -ft
Slope Angle, As= 0
Batter Angle, Ab= 0

Soil Data:

Depth -ft	Gamma -lb/f3	Phi	C -kp/f2	K -lb/i3	e50 or Dr %	Nspt
0	125.6	39.1	0.00	219.4	76.49	41
3	69.9	0.0	2.25	708.4	0.61	18
5	64.3	0.0	1.01	227.3	0.99	8
24	59.0	36.4	0.00	67.2	53.92	20
28	61.8	38.7	0.00	113.6	72.35	37
36	64.3	29.0	0.51	227.3	0.99	8
42	59.7	37.0	0.00	76.1	57.91	23
50	61.7	38.6	0.00	112.0	71.77	36
58	66.9	0.0	1.26	317.7	0.87	10

Pile Data:

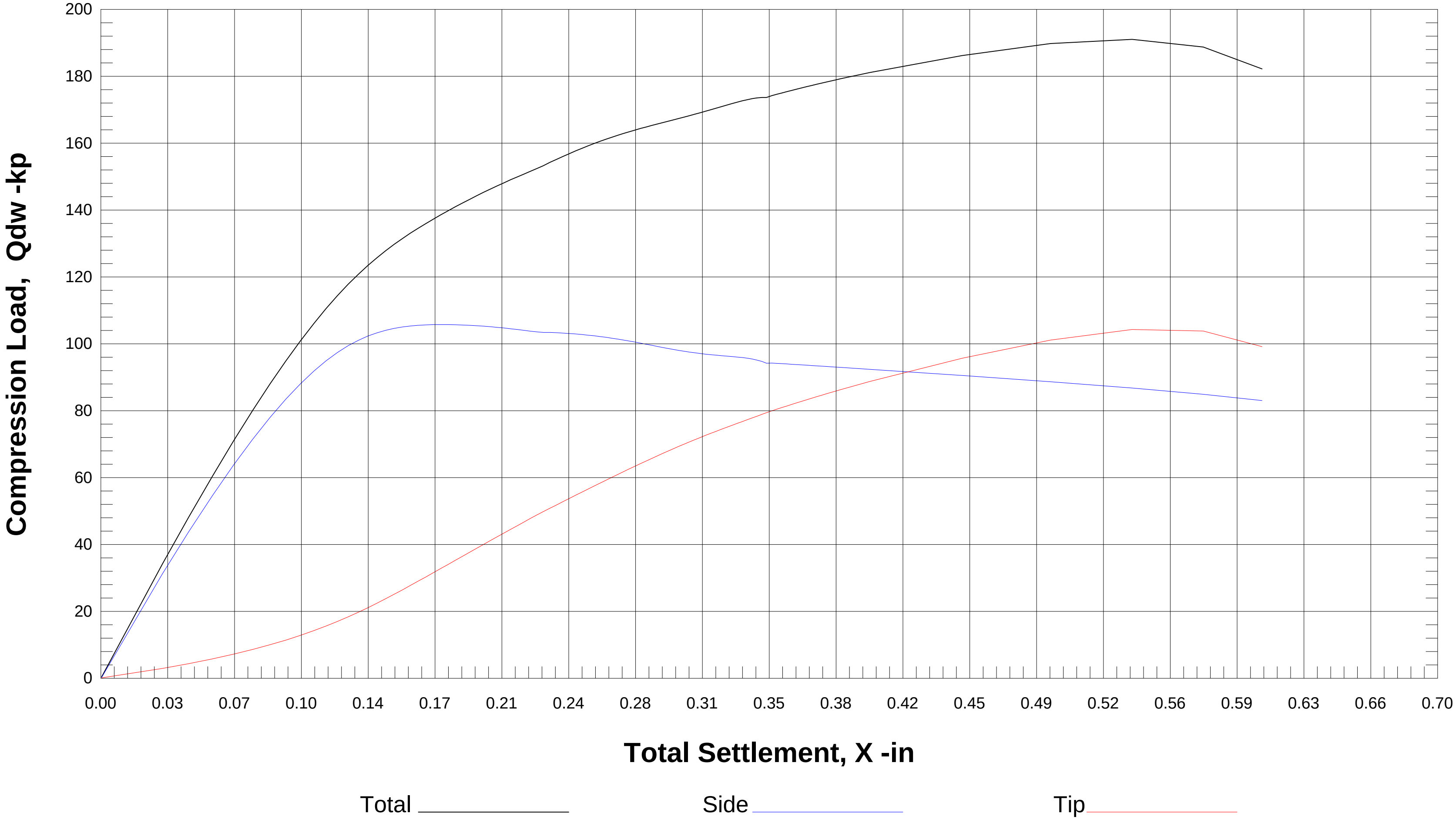
Depth -ft	Width -in	Area -in2	Per. -in	I -in4	E -kp/i2	Weight -kp/f
0.0	12.75	12.2	40.1	235.9	29000	0.041
35.0	12.75	127.7	40.1	235.9	29000	0.041

Vertical Capacity:
Weight above Ground= 0.00 Total Weight= 1.44-kp *Soil Weight is not included
Side Resistance (Down)= 73.821-kp Side Resistance (Up)= 63.075-kp
Tip Resistance (Down)= 38.858-kp Tip Resistance (Up)= 0.000-kp
Total Ultimate Capacity (Down) Qult= 112.679-kp Total Ultimate Capacity (Up)= 64.510-kp
Total Allowable Capacity (Down) Qallow= 70.425-kp Total Allowable Capacity (Up) Qallow= 36.477-kp
OK! Qallow > Q

Settlement Calculation:
At Q= 70.00-kp Settlement= 0.05828-in
At Xallow= 1.00-in Qallow= 99999.00000-kp

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

Vertical Load vs. Total Settlement



CivilTech Software

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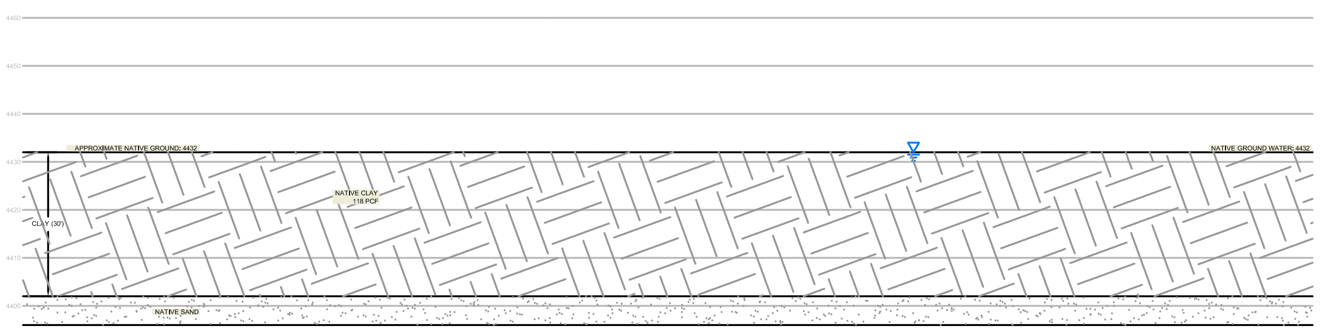
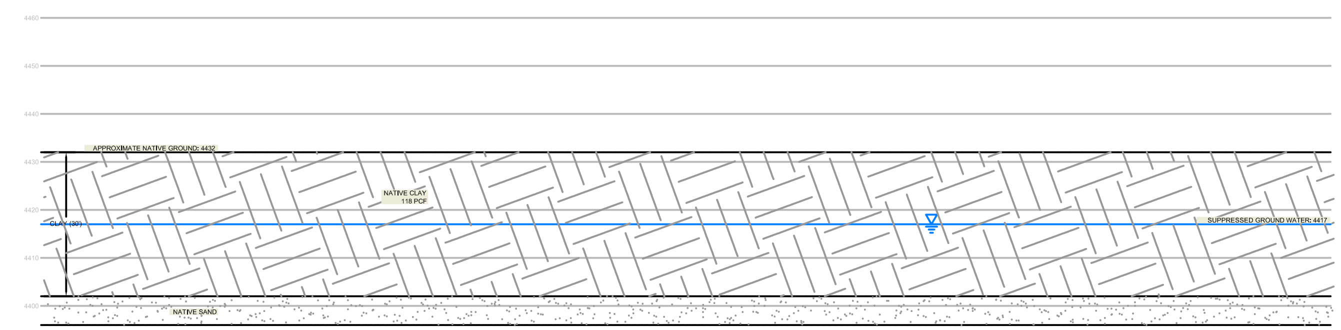
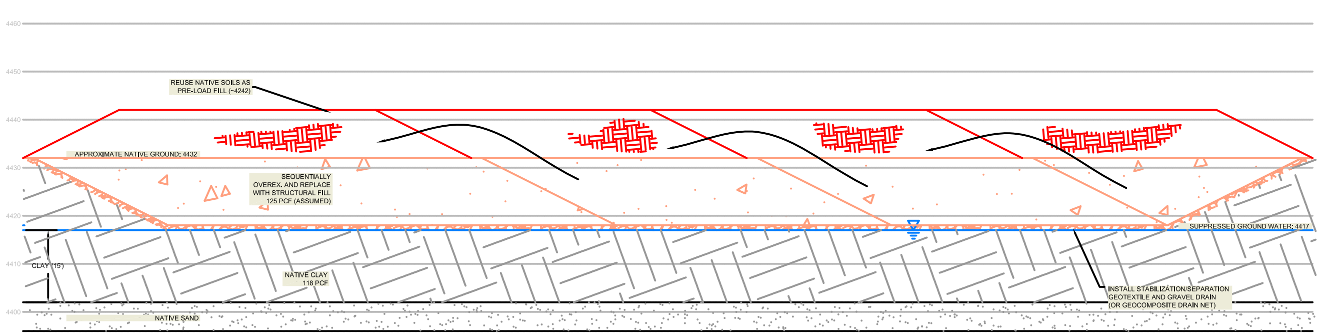
Figure D-5



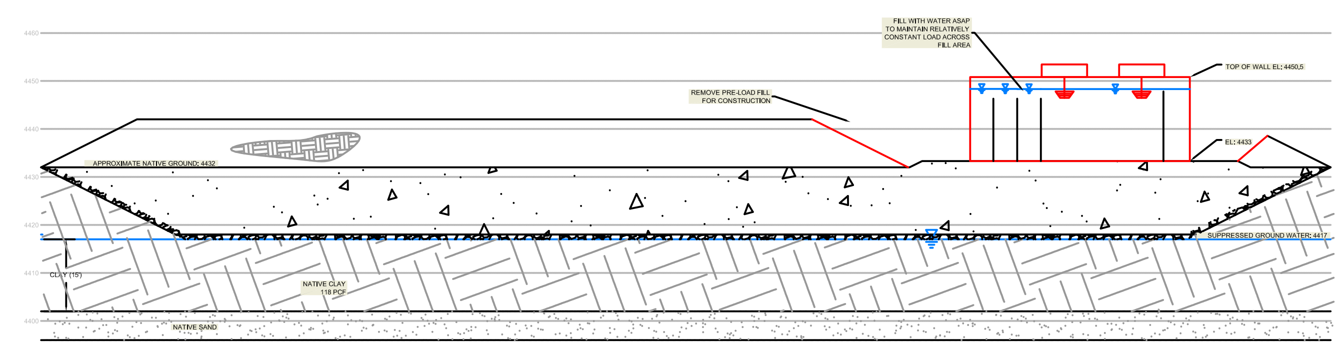
PRE-CONSTRUCTION



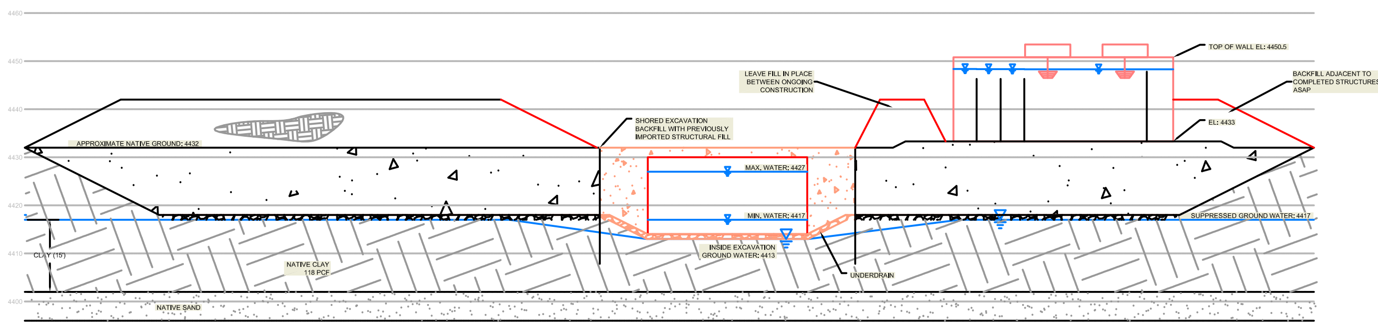
STAGE 1
GROUND WATER DRAW DOWN 15'
SCHEDULE: SEPT 2014 - MAR 2015



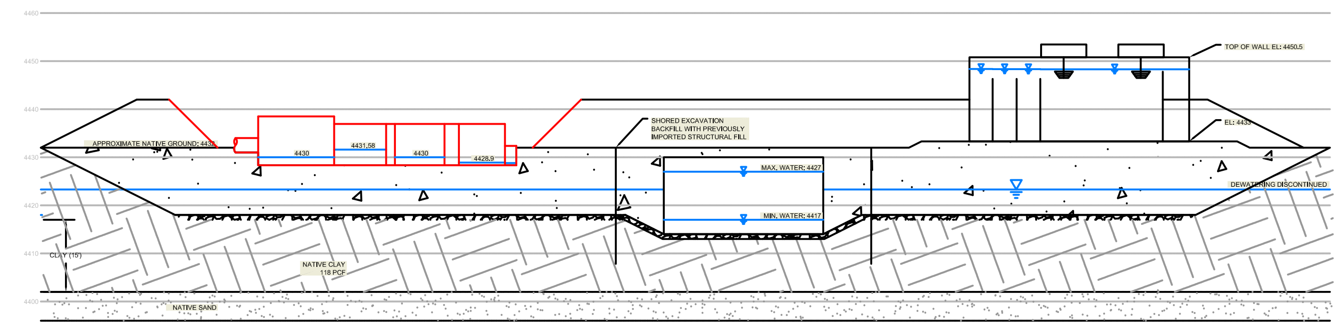
STAGE 2
OVEREX AND REPLACE 15' OF
NATIVE CLAY
SCHEDULE: APR 2015 - AUG 2016
CONST. & WAIT TIME: 18 MONTHS
SETTLEMENT: ~30.3 INCHES



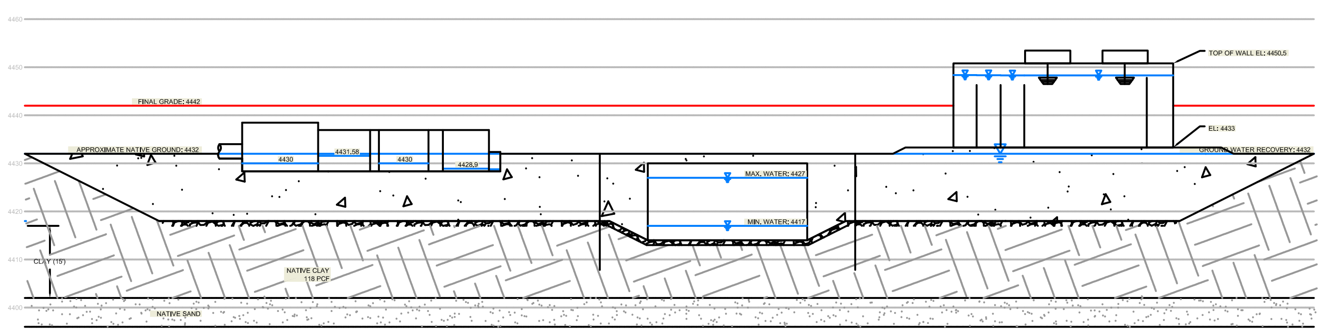
STAGE 3
BIOREACTORS
SCHEDULE: SEPT 2016 - SEPT 2018



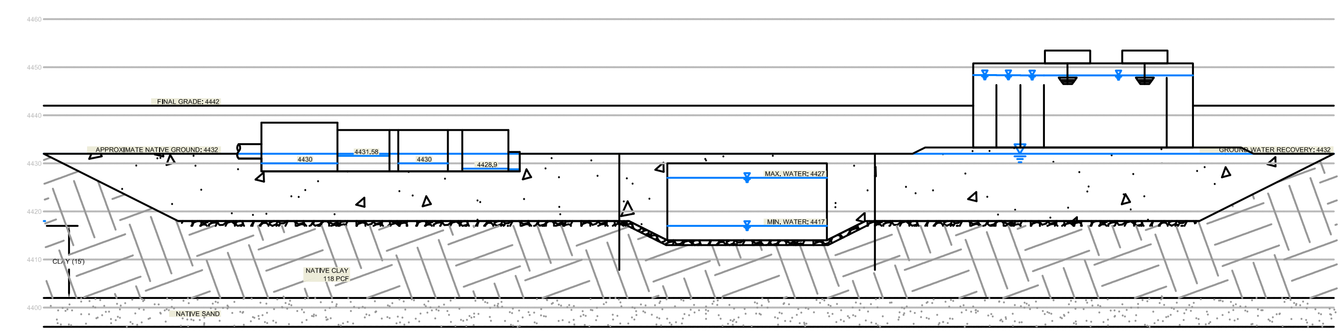
STAGE 4
EQUALIZATION BASIN & LIFT STATION
SCHEDULE: AUG 2017 - APRIL 2019



STAGE 5
SLUDGE BUILDING, FILTERS, ETC. SCHEDULE: FEB 2019 - APR 2020
SETTLEMENT: 26.19 IN (26.58 BETWEEN BLDGS.)
(3.9 IN REBOUND IF DEWATERING TERMINATED)



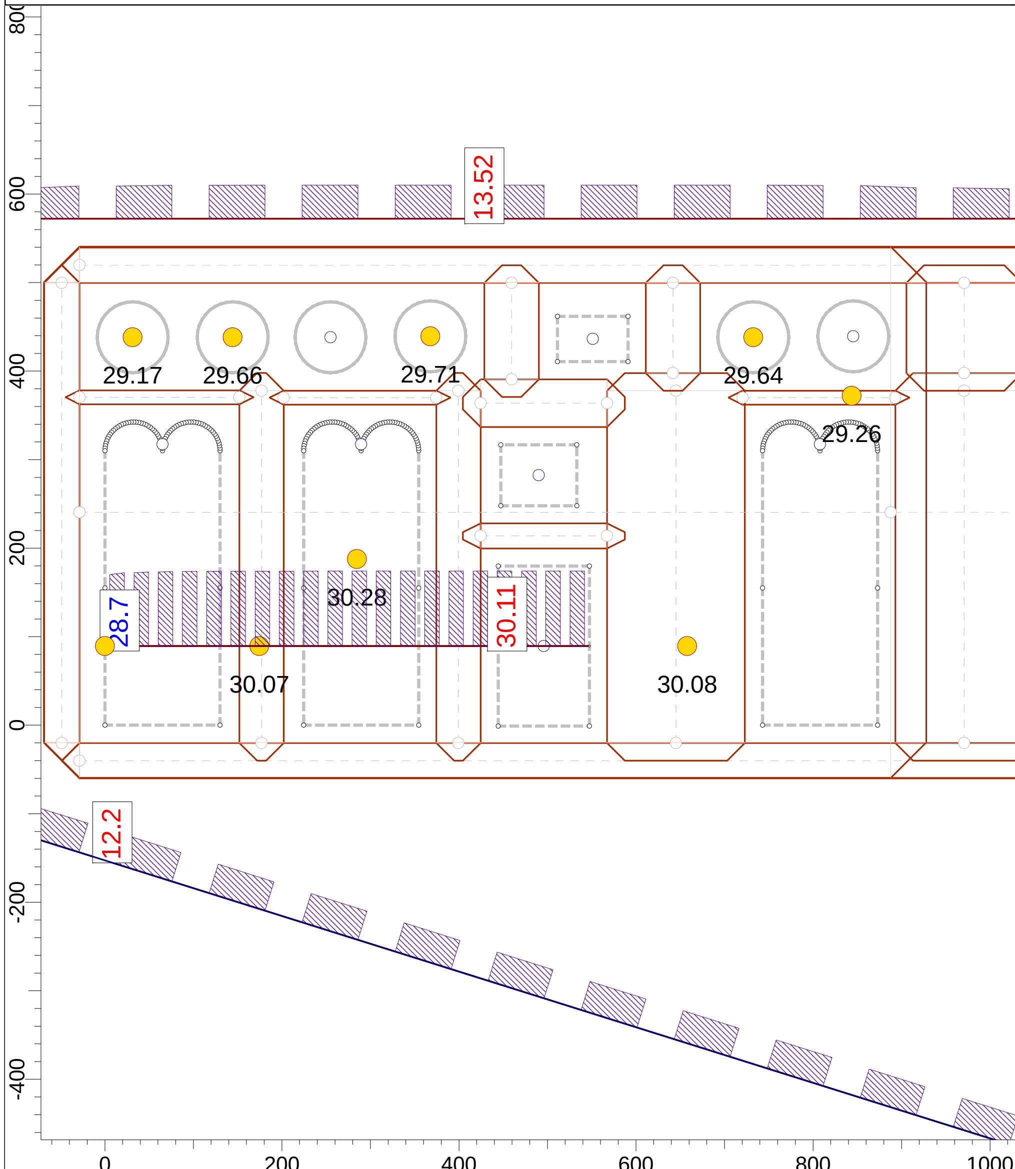
STAGE 6
FINAL GRADING/FILL PLACEMENT
SCHEDULE: APR 2020 - SEPT 2020
SETTLEMENT: 26.21 IN
(26.6 IN BETWEEN BUILDINGS)

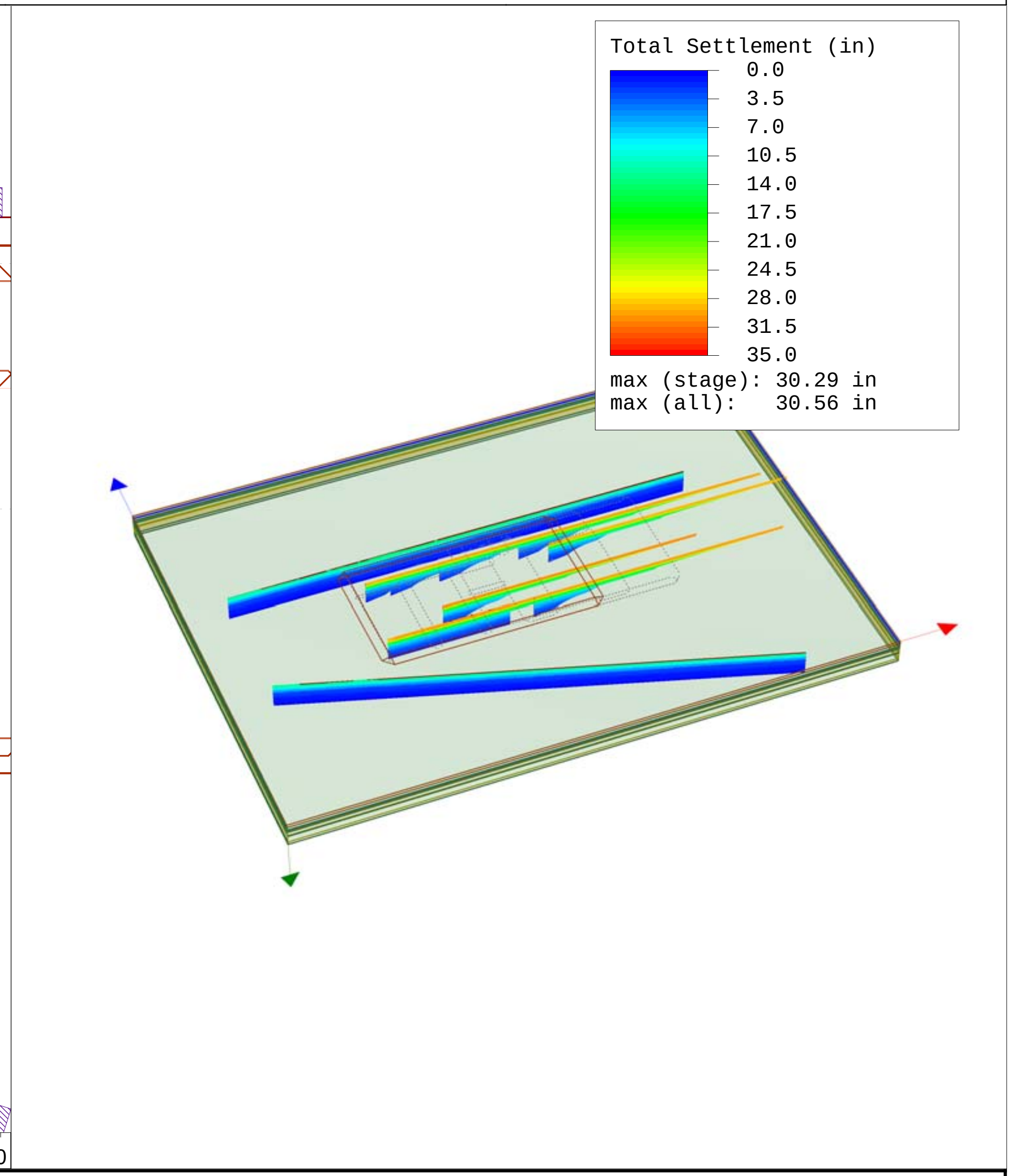


STAGE 6
AFTER PIPE CONNECTIONS,
LONG TERM SETTLEMENT: 26.82 IN
(27.20 IN BETWEEN BUILDINGS)

Jun 2016 - end of preload = 548 d

Data Type: Total Settlement





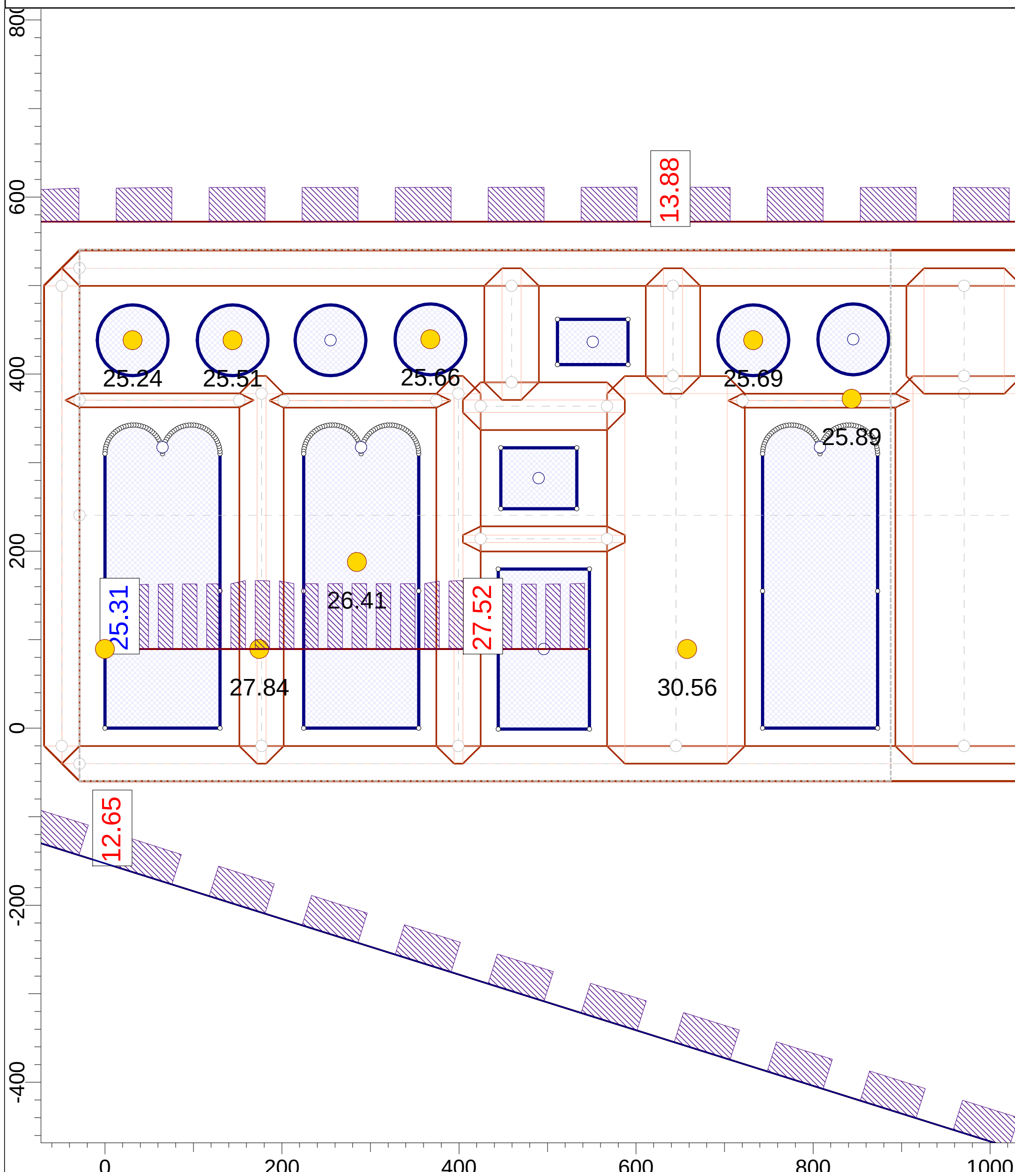
IGES®

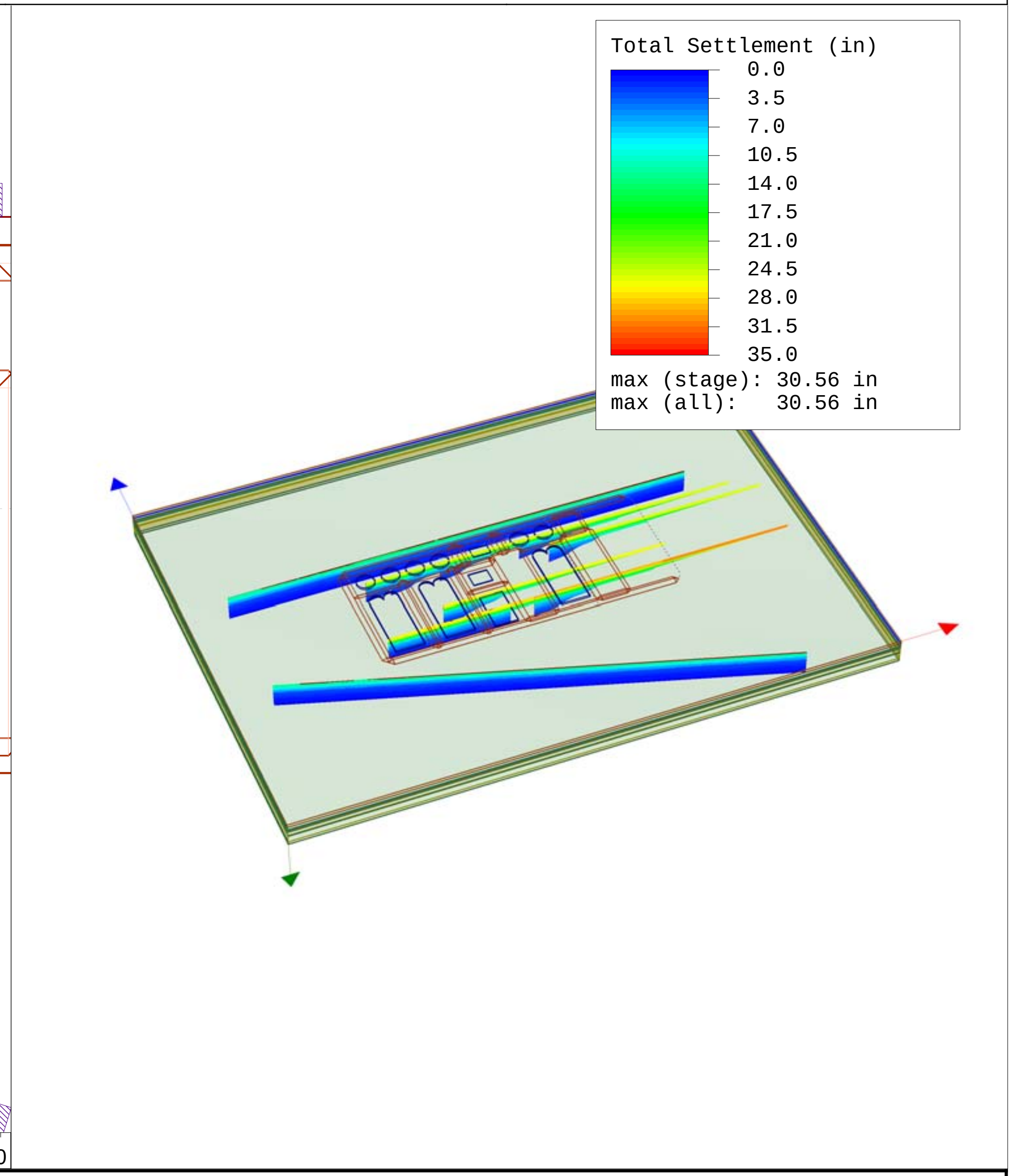
SETTLE3D 2.018

Project	Logan WWTP
Analysis Description	
Drawn By Joan Green	*Company* IGES Inc
Date 3/4/14	*File Name* excavated 10 ft mounded - longer preload time.s3z

stuctures built = 730 d

Data Type: Total Settlement





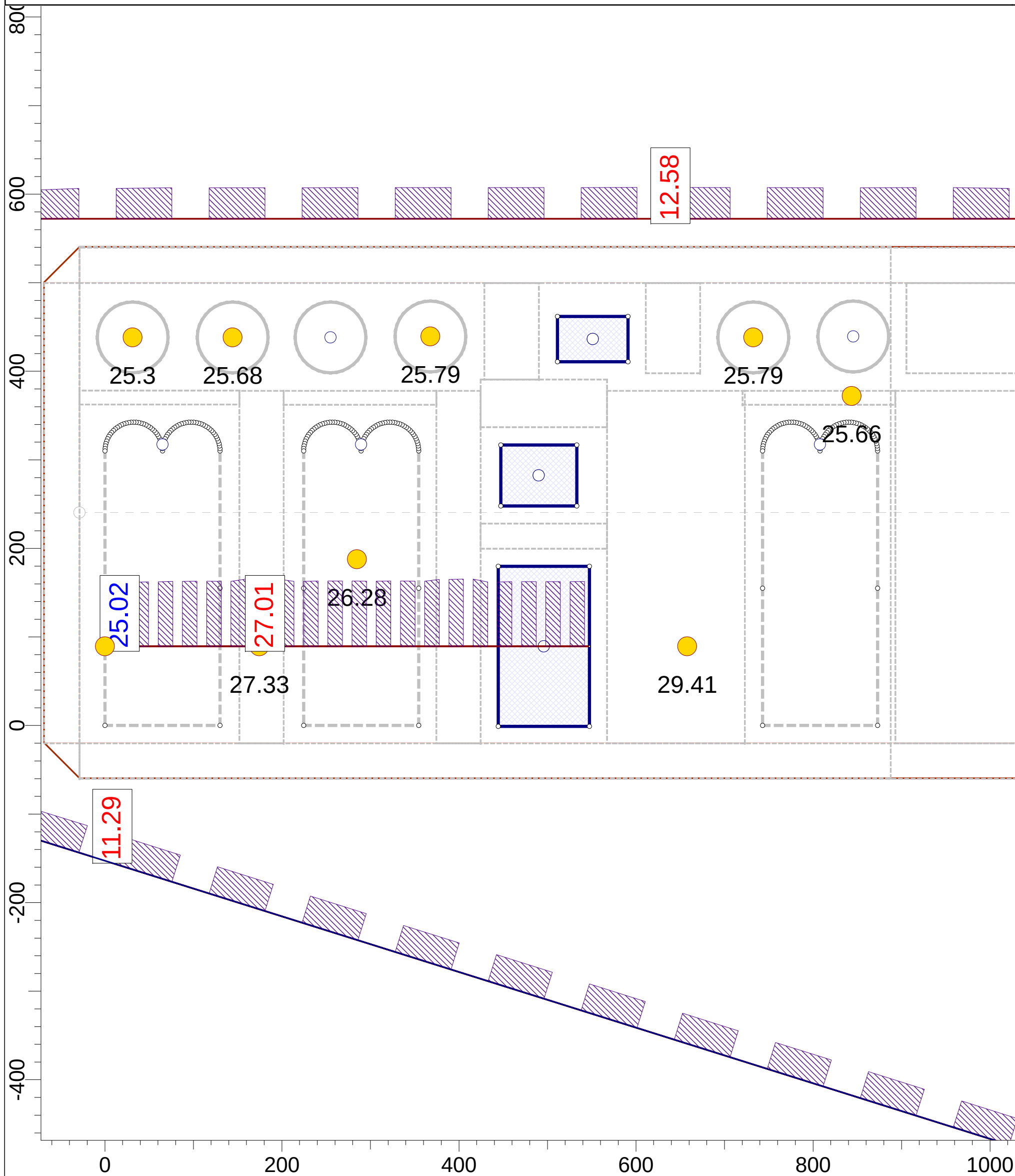
IGES®

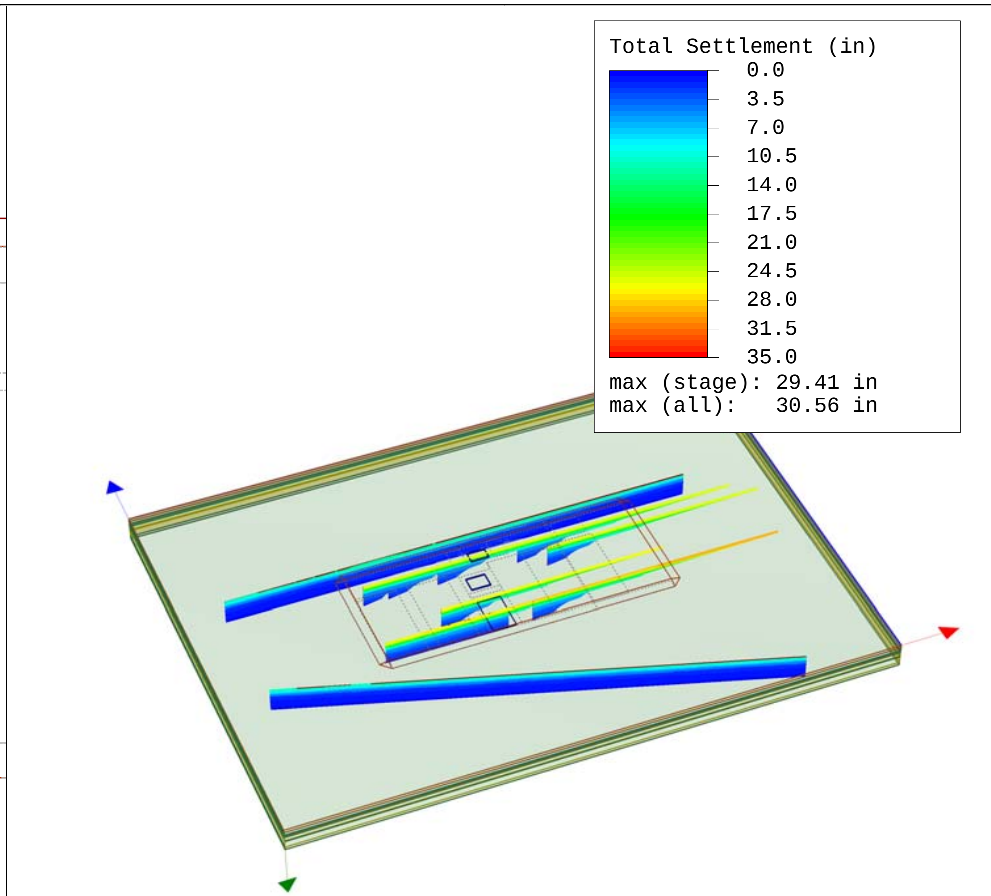
SETTLE3D 2.018

Project	Logan WWTP
Analysis Description	
Drawn By	Joan Green
Company	IGES Inc
Date	3/4/14
File Name	excavated 10 ft mounded - longer preload time.s3z

fill placement = 730.5 d

Data Type: Total Settlement





IGES®

SETTLE3D 2.018

Project

Logan WWTP

Analysis Description

Drawn By Joan Green

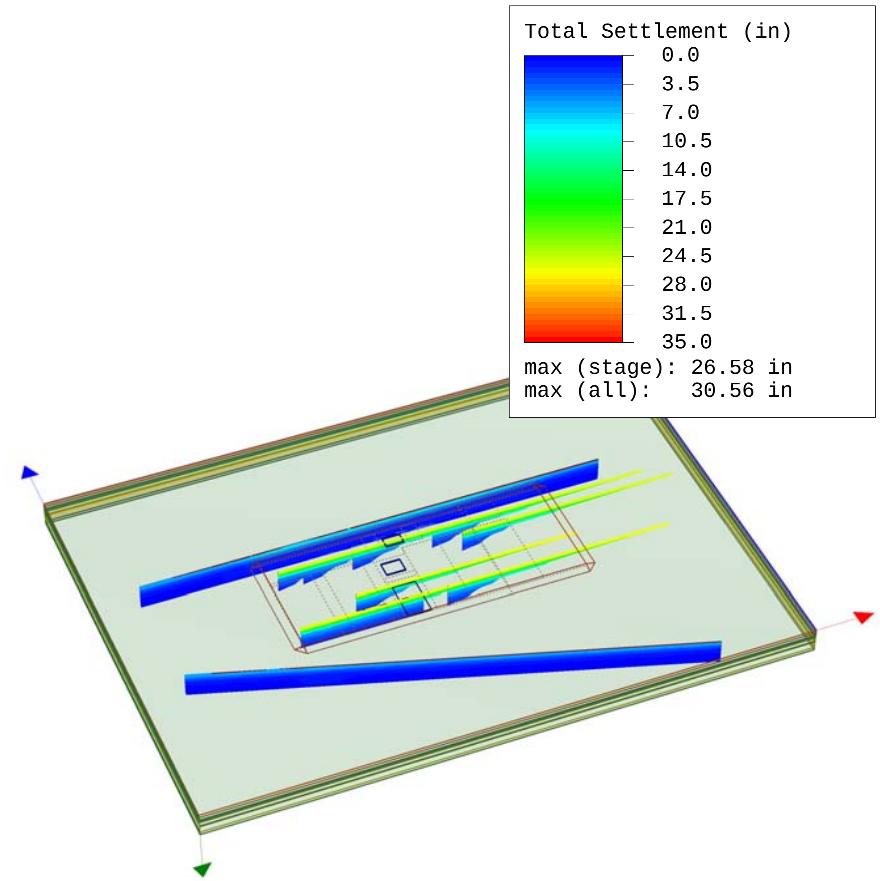
Company IGES Inc

Date 3/4/14

File Name excavated 10 ft mounded - longer preload time.s3z

April 2020 - Install pipes = 1948 d

Data Type: Total Settlement



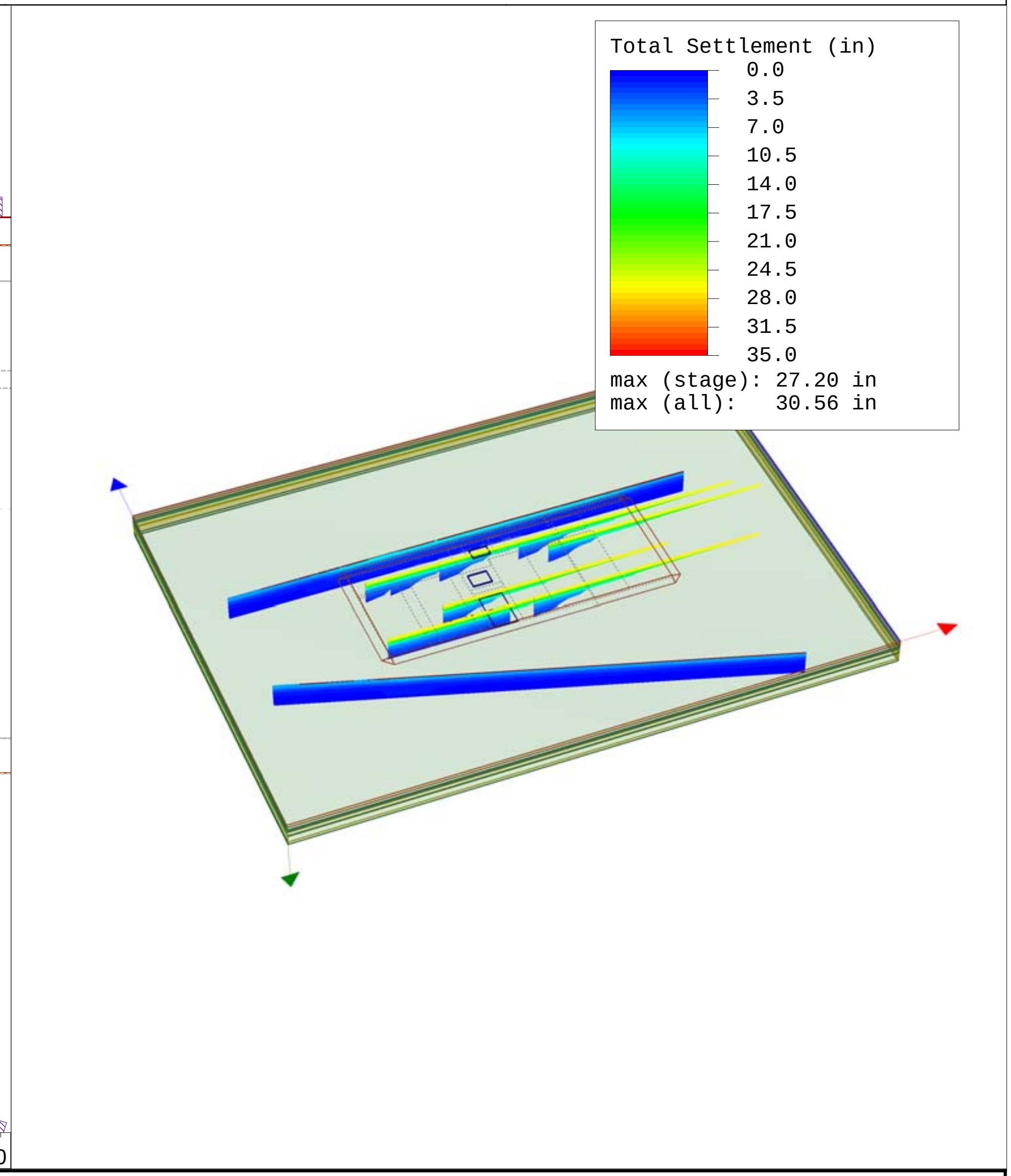
IGES®

SETTLE3D 2.018

Project	Logan WWTP		
Analysis Description			
Drawn By	Joan Green	*Company*	IGES Inc
Date	3/4/14	*File Name*	excavated 10 ft mounded - longer preload time.s3z

long term = 13059 d

Data Type: Total Settlement



SETTLE3D 2.018

Project	Logan WWTP		
Analysis Description			
Drawn By	Joan Green	*Company*	IGES Inc
Date	3/4/14	*File Name*	excavated 10 ft mounded - longer preload time.s3z

APPENDIX F