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Geotechnical • Geoscience • Materials Testing • Storm Water Compliance

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Mr. Michael Thomas
Trainor Robertson
701 University Avenue, Suite 200
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18 August, 2003
Project No. 03286

Subject: 7884 JON WAY
Granite Bay, California
*GEOTECHNICAL RECONNAISSANCE RELATED TO SUBSURFACE WATER
CONDITIONS*

- References:
- 1) Site Plan, 7884 Jon Way; Prepared By J Rider + design; Dated 6/3/02
 - 2) Preliminary Geotechnical Reconnaissance, 7884 Jon Way, Granite Bay, Ca; Prepared By Engeo Incorporated; Dated 5/28/03
 - 3) Improvement Plans for Hidden Lake Subdivision; Sheets 5 and 7 of 12; Prepared By GW Consulting, Dated As Built 6/28/78
 - 4) Miscellaneous notes from Hidden Lakes Subdivision Home Owners Association Meeting Minutes 1982 to 2003
 - 5) Aerial Photos

Dear Mr. Thomas,

This letter presents the results of Youngdahl Consulting Group, Inc. site reconnaissance, limited subsurface exploration, research findings and recommendations regarding subsurface drainage on the property located on 7884 Jon Drive in Granite Bay, California. The purpose of our study was to evaluate probable causes of seepage observed on the property, the extent and scope of the seepage and to provide recommendation for remediation.

Background

The property consists of a triangular shaped lot located on the southwest corner of Jon Way and Hidden Lakes Drive in Granite Bay. The lot was originally designated as Lot 25 and is now referred in drawings as Lot 71. The lot is bounded by Jon Way to the north, Lot 26 (now lot 72) to the southeast, Lot 55 (now Lot 70) to the west and the lake of Hidden Lake Unit No 2 to the south. The toe of the northern lake embankment forms the southerly lot property boundary. The property contains a two story, single family residence of wood frame construction. The home has a raised wood supported floor with an attached garage with a concrete slab-on-grade. We understand that the home was initially constructed in the late 1970's or early 1980's and that you purchased the home in May 2002. The home was remodeled during summer of 2002 and you moved into the home in November 2002.

During the remodeling activities we understand that the landscaping around the home was not watered due to the lack of electrical power and open water pipes. Despite the lack of irrigation and watering the rear of the property, landscaping and grass reportedly remained green throughout the summer. In the spring, due to the noted wet and swampy conditions you observed, you initiated the installation of additional drainage, landscaping and hardscape however, continued saturated surface conditions were noted in the rear of the backyard and easterly side yard. These wet conditions included the presence of standing water and swampy conditions in the south and east portions rear of the yard, limiting use of the backyard and precluding the installation of improvements in the backyard area. Areas where landscaping improvements were installed required the installation of numerous surface drains to divert areas of standing water.

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In an attempt to dry the near surface soil, we understand that the landscaping contractor installed a shallow subsurface "french" drain along the Southerly property boundary. Based on conversations with you and a review of photos taken during the subdrain installation (May/June 2003), standing water was encountered at a depth of less than 1 foot below grade in the southern portion of the yard. The drain consisted of a PVC pipe enveloped in filter fabric installed to a depth of approximately 2 ½ feet, paralleling the south property line with a below grade sump installed in the southeast corner of the lot. A solid "tight" discharge pipe was installed along the east property line which daylights near the intersection of Jon Way and Hidden Lakes Drive. During drain installation, a previously installed buried 55 gallon drum was encountered in the southeast corner of the lot. The installation of this drain and outlet reportedly impacted the existing planted areas.

Youngdahl Consulting Group, Inc. initially visited the property on 1 July 2003. At the time of our initial site visit, the near surface soils in the south portion of the yard were still very wet and the sump was operating with a near continual discharge of water at the outlet. The drain appeared only partially successful in intercepting subsurface water flow onto the property.

The landscaping contractor began installation of additional drainage, irrigation and replacement of the landscaping damaged by the previous work in the backyard area in early August 2003. During these activities we conducted several site visits to observe subsurface conditions. We requested that the contractor auger three potholes in the backyard area to access subsurface rock and water conditions. These shallow exploration points were backfilled with crushed rock and a standpipe to serve as a crude monitoring well to gauge subsurface water elevations and conditions.

Findings

To evaluate probable sources of water intrusion we conducted a review of available County of Placer records and aerial photos on the lot and surrounding properties. The improvement plans (reference 3) show that the lot was initially designated as Lot 25 (aka Lot 71) within Hidden Lakes Subdivision. Topography of the lot is shown to slope to the east towards an unnamed drainage swale located between Lots 25 (71) and 26 (70). Lot 25 (71) has elevation high of 468 feet sloping to the southeast and northeast to an elevation of 460 feet. We understand from conversations with the civil engineer that the lots were "no grade" lots and original grading activities during subdivision development were confined to installation of the lake, streets and underground improvements.

The adjacent Lake 2 shows a water surface elevation of 469 feet (approximately 5 feet above the toe of the slope) with the bottom of the lake shown at elevation 455 feet. The top of the embankment is set at bank elevation 472 feet with a downslope gradient of 3 horizontal to 1 vertical. An emergency overflow outlet pipe consisting of a 15-inch CMP is shown through the embankment from the lake. This pipe outlets at the joint property line of Lots 25/26. The flow line of the outlet is designated at elevation 462.54 feet.

We could not find records of a geotechnical study of the subdivision or records of grading activities during the Lake and subdivision construction. The improvement plans reference that the dam embankment should be constructed of on-site soils compacted to 95% of the ASTM D 1557-70. Minimal (6-inch) scarification of the original ground surface is noted; no keyway or core within the embankment is specified. The plans call for "the upstream slope of the dam and with "no less than one pound per square foot" bentonite. There is some question as to whether bentonite was installed following lake construction. A "10 foot apron along the bottom of the reservoir (at the toe of the upstream slope" was specified to be treated during construction.



A cursory review of minutes from the Hidden Lakes homeowners association (HOA) revealed that seepage from the Lake has been an on-going issue in the subdivision. Minutes from 10/10/1989 note an "unexplained continual drop in lake levels" and in 12/11/90 that the "lake continues to lose water due to unknown seepage areas". In 4/90 an estimate by the HOA landscaping and lakes committee was performed and total losses (seepage and evapotranspiration) of "51,750 cubic feet of water per month" were estimated. Discussion is also noted in the minutes that the presence of bentonite was uncertain. The minutes from 8/11/92 have a report attached which Item # 10 refers to "The lakes have been leaking for many years" and "this may be the source of water infiltration in some properties adjoining the lakes". In 7/11/01 an estimate was obtained for lining of the lake with a geosynthetic liner to reduce seepage.

Conclusion

Based on the results of our research and observations, it is our professional opinion that the primary source of the water observed is seepage from the adjacent lake. Our rough measurements of groundwater levels within the exploration points show a hydraulic gradient to the north indicating that the lake is the source of the subsurface water. We suspect that seepage is occurring both through the bottom of the lake and through the toe of the embankment; an additional source of seepage appears to be the former drainage swale present between Lots 25 and 26 (aka Lots 71 & 72). The CMP outlet daylights on the adjacent property Lot 26 (aka Lot 72) near the toe of the embankment; the pipe does not include seepage cutoff collars (typically used to reduce seepage flow) and does not outlet into closed storm drain system. The former drainage swale intended to convey water toward the front of the lots appears to have been partially backfilled. Given the absence of a cutoff trench at the toe, water from the lake is likely continuing to flow through trench backfill and into the former drainage swale.

As stated in the findings section of this report, GW Consulting does not believe that bentonite was used to "seal" the lake. Even if the bentonite seal is present, the plans do not call for a continuous liner to be installed. Treatment of only a portion of the base of the lake would likely be ineffective in eliminating all seepage. Several methods exist to reduce seepage through embankments and pond areas. These methods sometimes include a minimum thickness of 2 feet of low permeability soil is used for an earthen liner which is installed continuously along the bottom of the pond as well as the embankment sidewalls. Alternative methods include the use of geosynthetic liners, bentonite seals, cutoff walls or a zoned core (consisting of low permeability soils) within the earthen dam.

The near surface soils consist of weathered decomposed granite which generally can be classified as silty sand soils; typically, these soils have relatively high permeability. Re-compaction of these soils, while reducing permeability, is unlikely to create an impermeable embankment for water migration. Generally, lined impoundments require liners to have permeabilities on the order of 10^{-8} cm/sec. Silty sand soils in a compacted state typically have permeabilities on the order of 10^{-4} cm/sec, several orders of magnitude less than what is required for a low permeability condition.

With the absence of a functioning liner within the lake, or cutoff trench within/or at the toe of the embankment, seepage will most likely continue to be a recurring problem (as already documented in the past by the HOA). The installation of an intercept drain at the toe of the embankment will aid to divert seepage as an immediate relief of the wet conditions, but installation of a liner within the lake should be considered as a permanent solution. General practice dictates that seepage sources be addressed when possible, and as a less preferred option, install drainage (surface and subsurface) to deal with the effects of the emanating seepage. The general reasons for this are that once seepage has been allowed to occur, intercepting and collecting all sources becomes an almost impossible task.



Continued seepage onto the property can adversely effect future use of the backyard, pool repairs, landscaping and possibly could effect the home should subsurface water be present or daylight beneath the residence. If present, free water in contact with framing can compromise wood members which can wick into sheetrock and roofing materials. Additionally, stagnant water or saturation could cause mold growth. We understand that testing for mold has been performed prior to the sale of the residence and none was detected.

We understand that improvements to the existing pool are proposed. Hydrostatic pressure can cause an emptied pool to "float". The seepage quantities occurring on-site is likely to cause sufficient hydrostatic pressure to cause this buoyant "floating" condition. The installation of a pressure relief system at the base of the pool is recommended prior to pool repair. This is an expensive and complex option that may not be effective.

Recommendations

For immediate relief purposes, we recommend that a new subdrain be installed along the south and east property line to intercept subsurface water flow as shown on Figure 1. The drain should be deepened into bedrock materials a minimum depth of 1 foot to intercept water which may be perched along the soil/bedrock contact. We recommend that the drain be designed as a gravity flow system which discharges into the drain inlet located at the Jon Drive/ Hidden Lakes Drive intersection. Given the elevation of the property and depth to water, a minimum pipe gradient of 0.5 percent should be maintained. A sump should be positioned near the outlet as a precaution should additional dewatering be required due to excess lake seepage, outflow and rainfall. The last 20 foot of the drain line should be a solid "tight" pipe with a grout collar positioned at the junction of the perforated and tight pipe to reduce the potential for water migrating from the line back to the home.

The drain should consist of a 4-inch rigid wall perforated pipe surrounded by permeable material which is covered with filter fabric. The down-gradient side of the trench should include the installation of a waterproofing membrane to limit water infiltration into the surrounding sandy soils. A typical subdrain detail is shown on Figure 2. These measures are temporary only and are unlikely to completely alleviate damaging effects of seepage.

For permanent relief of the seepage conditions, a liner should be installed in the lake to prevent excessive seepage from impacting these low lying lots. When this repair occurs, the installed drainage systems as detailed above will become a secondary line of defense against adverse impacts related seepage migration onto the property.

Limitations

It should be noted that our comments, conclusions and recommendations are based on visual observations and limited exploration of subsurface conditions. We were not present during grading of the lake or subdivision or installation of the existing subdrain system on the property. Our scope of work has not, to date, included any detailed hydrologic characterization or environmental assessment of the residential structure.



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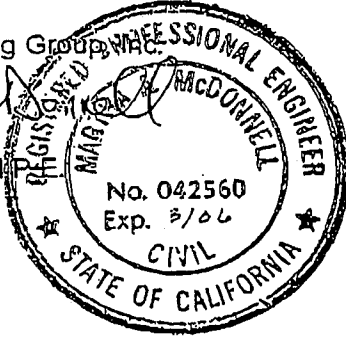
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We appreciate the opportunity to be of service on this project. If you have any questions regarding this report or any aspects of the project, please feel free to contact our office.

Very truly yours,
Youngdahl Consulting Group, Inc.

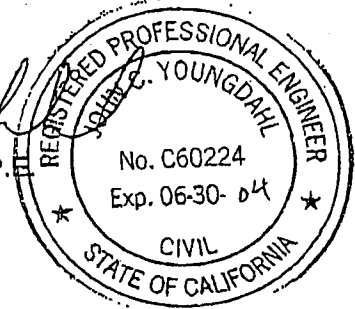
Martha A. McDonnell

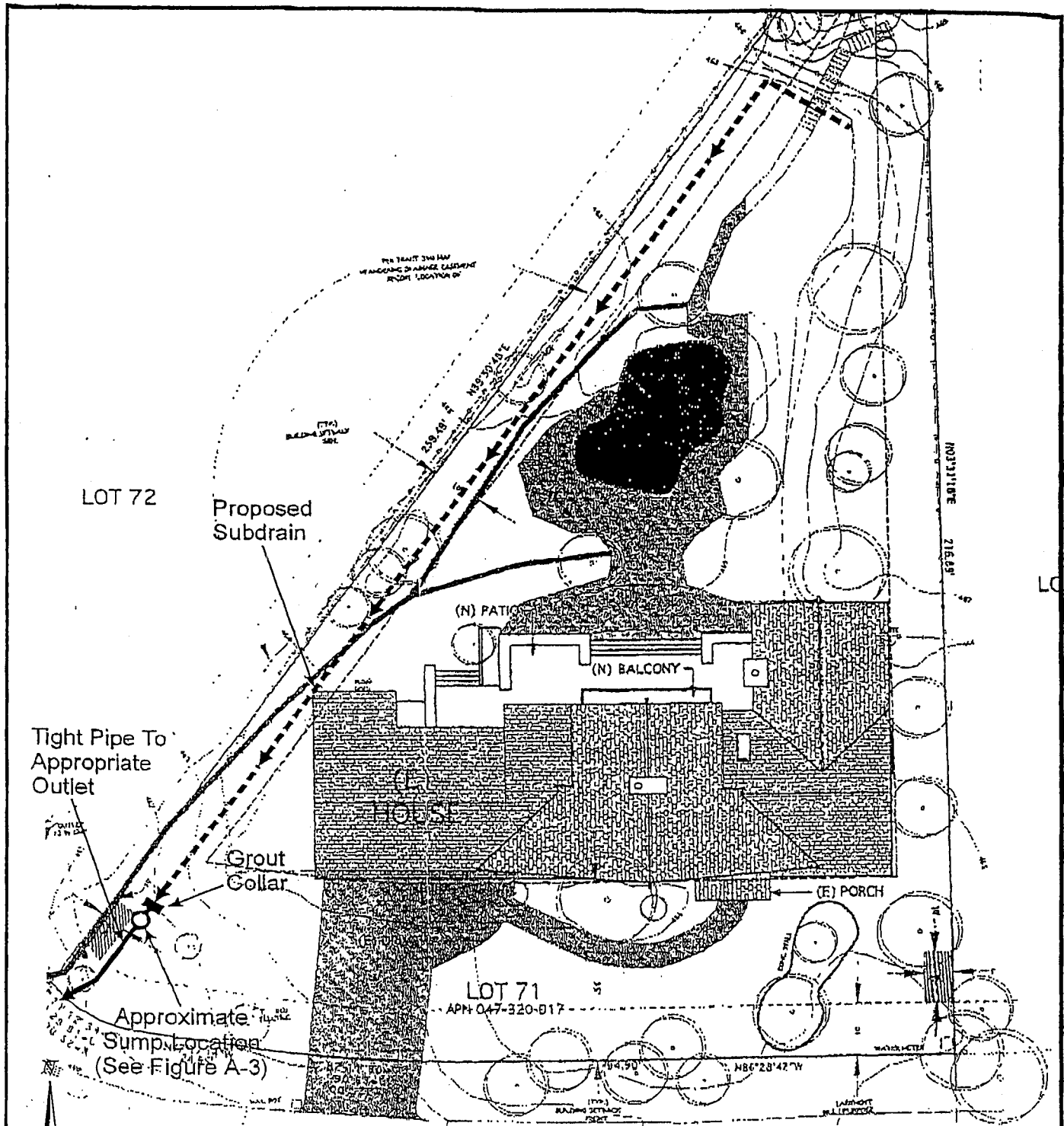
Martha A. McDonnell
Associate Engineer



Reviewed By:

John C. Youngdahl
John C. Youngdahl, P.E.
Principal Engineer





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REFERENCE: Jrider & Design dated 30 June 2002

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 August 2003

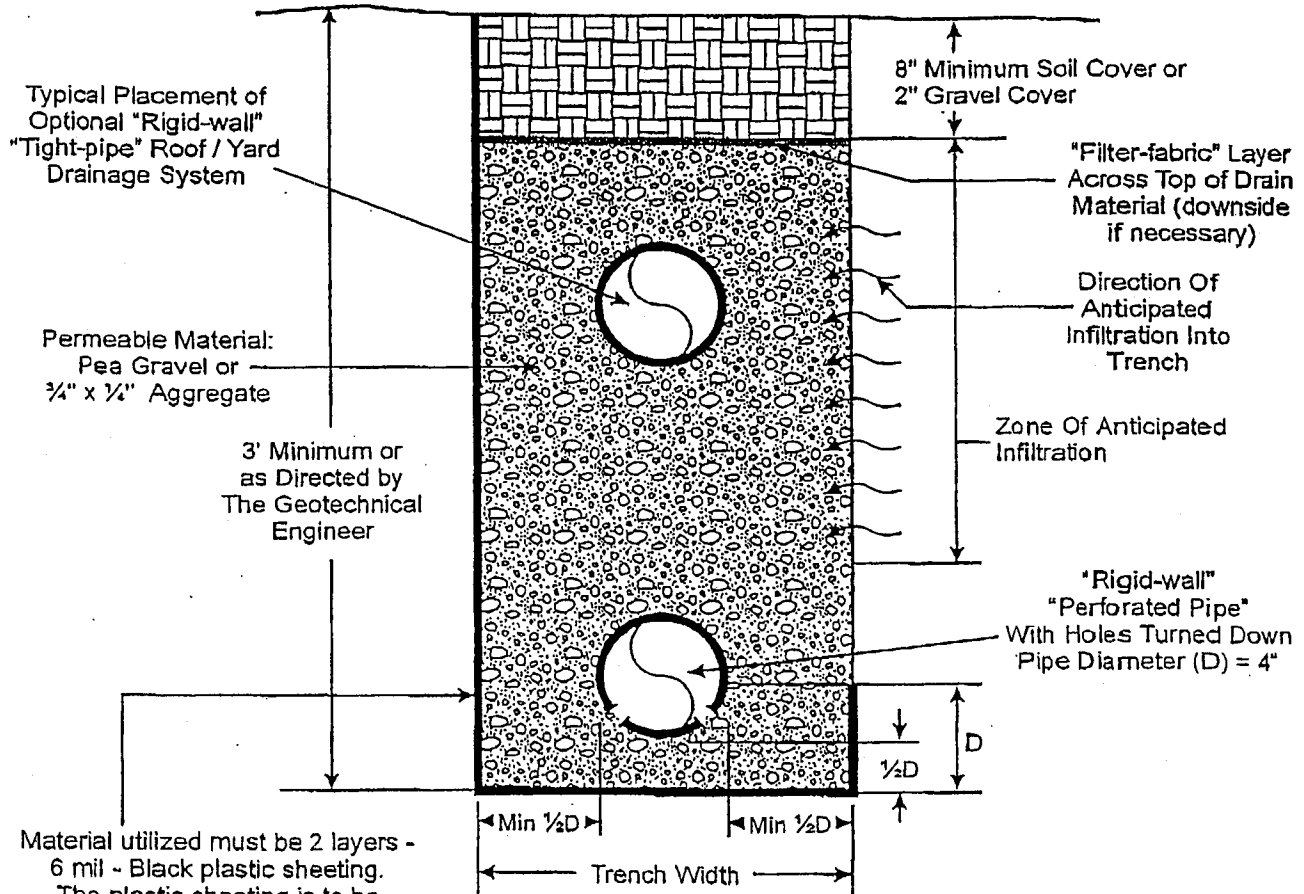
SITE PLAN
 Jon Way (7884)
 Granite Bay, California

FIGURE
 A-1

"Perforated Pipe Sub-Drain" Installation

Typical Cross Section

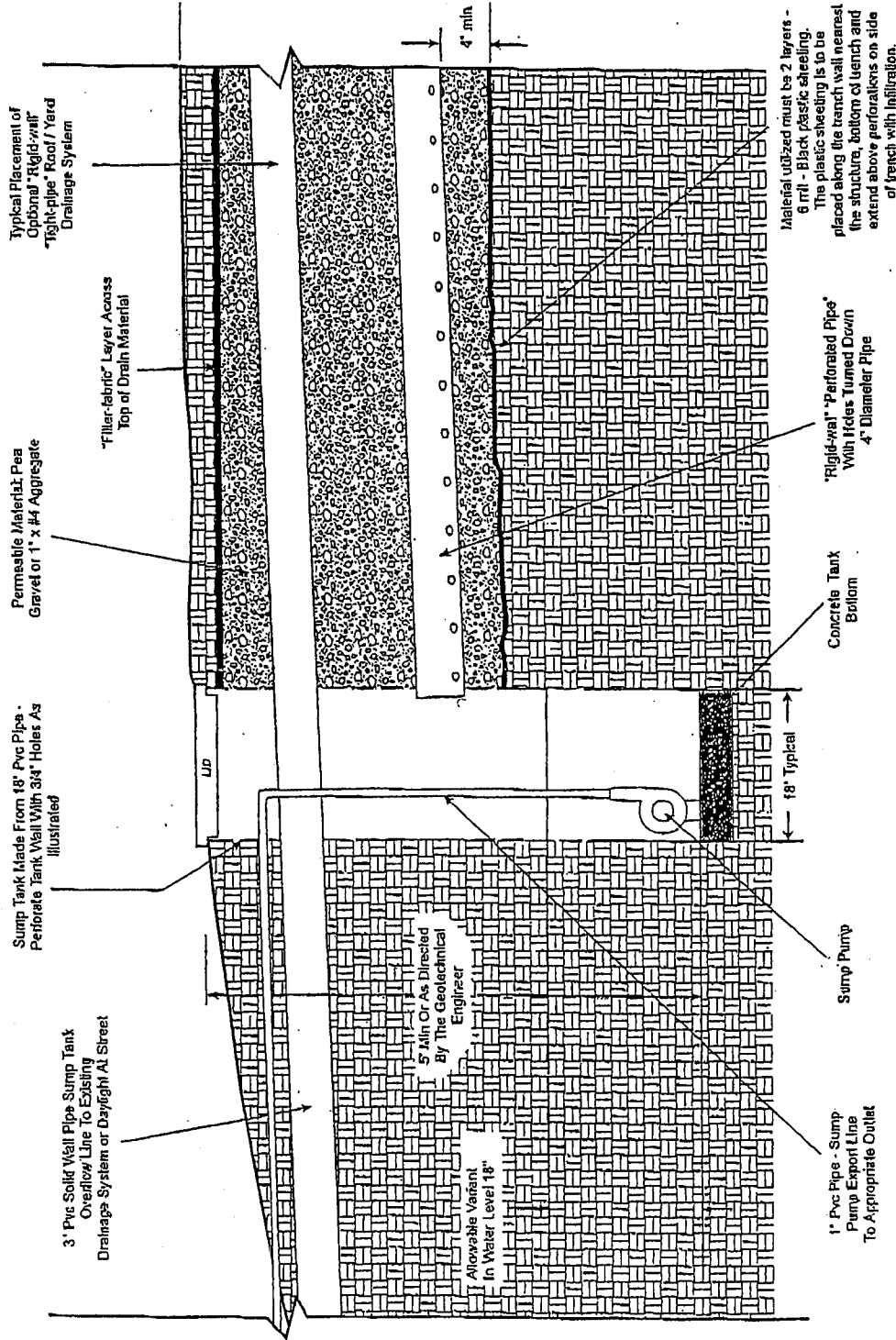
(With "Tight-pipe" Roof / Yard Drain Installation)



Material utilized must be 2 layers - 6 mil - Black plastic sheeting. The plastic sheeting is to be placed along the trench wall nearest the structure, bottom of trench and extend above perforations on side of trench with infiltration.

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- NOTES:
1. Slope trench and "rigid-wall" pipes at least 1% gradient to drain.
 2. Use "sweeps" for directional changes in pipe flow (do not use elbows).
 3. Provide periodic "clean-outs".
 4. Washed clean permeable material.
 5. Trench to be excavated a minimum of 12" below zone of infiltration



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1. Slope trench and "rigid-wall" pipes at least 1% gradient to drain.
 2. Use "sweeps" for directional changes in pipe flow (do not use elbows).
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 4. Washed clean permeable material.

Project No.: 03288

SUB-DRAIN & SUMP SYSTEM DETAIL

Jon Way (7884)
Granite Bay, California

