ALTA/NSPS LAND TITLE SURVEY

CANYON CREEK SUBDIVISION FILING NO. 5, 1ST AMENDMENT BEING SITUATE WITHIN AND A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH P.M., COUNTY OF BOULDER, STATE OF COLORADO

PROPERTY DESCRIPTION(S):

A TRACT OF LAND LOCATED IN THE SOUTHEAST QUARTER OF SECTION TWENTY-FOUT (24), TOWNSHIP ONE NORTH (T.1N.), RANGE SIXTY-NINE WEST (R.69W.) OF THE SIXTH PRINCIPAL MERIDIAN (6TH P.M.), TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

CANYON CREEK SUBDIVISION FILING NO. 5, 1ST AMENDMENT RECORDED FEBRUARY 6, 2019 AS RECEPTION NO. 03697079 OF THE RECORDS OF BOULDER COUNTY.

SAID DESCRIBED PARCEL(S) CONTAIN A TOTAL OF 80,282 SQ. FT OR 1.84 ACRES, MORE OR LESS.

NOTES:

1) Fidelity National Title Insurance Company, Order No. F0528473-158-CMN, dated November 2, 2015 at 6:00 P.M. was used in the process of this survey and the following comments correspond to Schedule B of the commitment .

2) **Schedule B - Section II Exceptions:**

3. The right of proprietor of a vein or lode to extract or remove his ore should the same be found to penetrate or intersect the premises thereby granted as reserved in United States patent recorded September 7, 1874 in Book 31 at Page 52; and any and all assignments thereof or interest therein.
- NOT PLOTTABLE, BLANKET IN NATURE, INCLUSIVE OF SUBJECT PARCEL.

4. Any and all interest in all coal, oil, gas and other minerals as reserved by Carl A. Miller, Fern Miller Wikstrand and Helen Miller in the Warranty Deed recorded June 2, 1958 in Book 1076 at Page 265, and any and all assignments thereof or interests therein. Waiver of Surface Rights recorded November 16, 2001 at Reception No. 2220515.
- NOT PLOTTABLE, BLANKET IN NATURE, INCLUSIVE OF SUBJECT PARCEL.

5. Any and all interest in all coal, oil, gas and other minerals as reserved by James S. Haley, Trustee in the Warranty Deed recorded December 30, 1969 at Reception No. 932667, and any and all assignments thereof or interests therein.
- NOT PLOTTABLE, BLANKET IN NATURE, INCLUSIVE OF SUBJECT PARCEL.

6. Oil and Gas Leases to J. Michael McGhee, as Lessee recorded September 30, 1981 at Reception No. 466151 and Reception No. 466152, and Reception No. 466153 and Reception No. 466154, and any and all assignments thereof or interests therein. Production Affidavit recorded December 12, 1985 at Reception No. 730940 given in connection with the above Oil and Gas Leases.
- NOT PLOTTABLE, BLANKET IN NATURE, INCLUSIVE OF SUBJECT PARCEL.

7. Right-of-Way for a pipe line and incidental purposes granted to Panhandle Eastern Pipeline Company by the instrument recorded October 30, 1981 at Reception No. 470726 insofar as the same may affect subject property. The exact location of said easement was not defined or specified therein.
- NOT PLOTTABLE, BLANKET IN NATURE, INCLUSIVE OF SUBJECT PARCEL.

8. Terms, conditions, provisions, agreements and obligations contained in Ordinance No. 733 of the Town of Erie, Colorado recorded April 26, 2001 at Reception No. 2142188 and in Canyon Creek PD Development Plan an Amendment of the Homestake PUD recorded July 9, 2001 at Reception No. 2171024.
- NOT PLOTTABLE, BLANKET IN NATURE, INCLUSIVE OF SUBJECT PARCEL.

9. Terms, conditions, provisions, agreements and obligations contained in Ordinance No. 740 of the Town of Erie, Colorado recorded May 29, 2001 at Reception No. 2154224, in Ordinance No. 753 of the Town of Erie, Colorado recorded August 29, 2001 at Reception No. 2190499 and in Ordinance No. 762 of the Town of Erie, Colorado recorded November 15, 2001 at Reception No. 2219656.
- NOT PLOTTABLE, BLANKET IN NATURE, INCLUSIVE OF SUBJECT PARCEL.

10. Terms, conditions, provisions, agreements and obligations contained in the Canyon Creek Filing No. 5 Development Agreement recorded October 19, 2001 at Reception No. 2209649 and in First Amendment with respect thereto recorded February 28, 2002 at Reception No. 2259497
- NOT PLOTTABLE, BLANKET IN NATURE, INCLUSIVE OF SUBJECT PARCEL.

11. Covenants, conditions and restrictions but omitting any covenants or restrictions, if any, including but not limited to those based upon race, color, religion, sex, sexual orientation, familial status, marital status, disability, handicap, national origin, ancestry, source of income, gender, gender identity, gender expression, medical condition or genetic information, as set forth in applicable state or federal laws, except to the extent that said covenant or restriction is permitted by applicable law, as set forth in the document, and any and all amendments and supplements thereto
Recording Date: July 26, 2001
Recording No: Reception No. 2177513
- NOT PLOTTABLE, BLANKET IN NATURE, NOT INCLUSIVE OF SUBJECT PARCEL.

12. All reservations, notes and exceptions as shown on Special Warranty Deed recorded November 16, 2011 at Reception No. 2220516.
- PLOTTED EXCEPTION #12 AND EXCEPTION #15 FROM SWD

13. Terms, conditions, provisions, agreements and obligations contained in the Use Agreement as set forth below:
Recording Date: November 16, 2001
Recording No.: Reception No. 2220517
- NOT PLOTTABLE, BLANKET IN NATURE, INCLUSIVE OF SUBJECT PARCEL.

14. The effect of the Map for Canyon Creek PD Amendment No. 3 recorded February 13, 2008 at Reception No. 2909751.
- NOT PLOTTABLE, BLANKET IN NATURE, INCLUSIVE OF SUBJECT PARCEL.

15. An oil and gas lease for the term therein provided with certain covenants, conditions and provisions, together with easements, if any, as set forth therein, and any and all assignments thereof or interests therein.
Recording Date: July 2, 2008
Recording No: Reception No. 2941007
- NOT PLOTTABLE, BLANKET IN NATURE, INCLUSIVE OF SUBJECT PARCEL.

16. The effect of the Map for Canyon Creek PD Amendment No. 6 recorded October 11, 2012 at Reception No. 3258805.
- NOT PLOTTABLE, BLANKET IN NATURE, INCLUSIVE OF SUBJECT PARCEL.

17. The effect of the Map for Canyon Creek PD Amendment No. 7 recorded July 23, 2015 at Reception No. 3461707.
- PLOTTED SETBACKS, BLANKET IN NATURE, INCLUSIVE OF SUBJECT PARCEL.

3) Gross land area is 80,282 square feet, or 1.84 acres, more or less.

4) There were NO existing buildings observed within the Subject Property in the process of conducting the field survey.

5) Access to the Subject Property is from Meller Street.

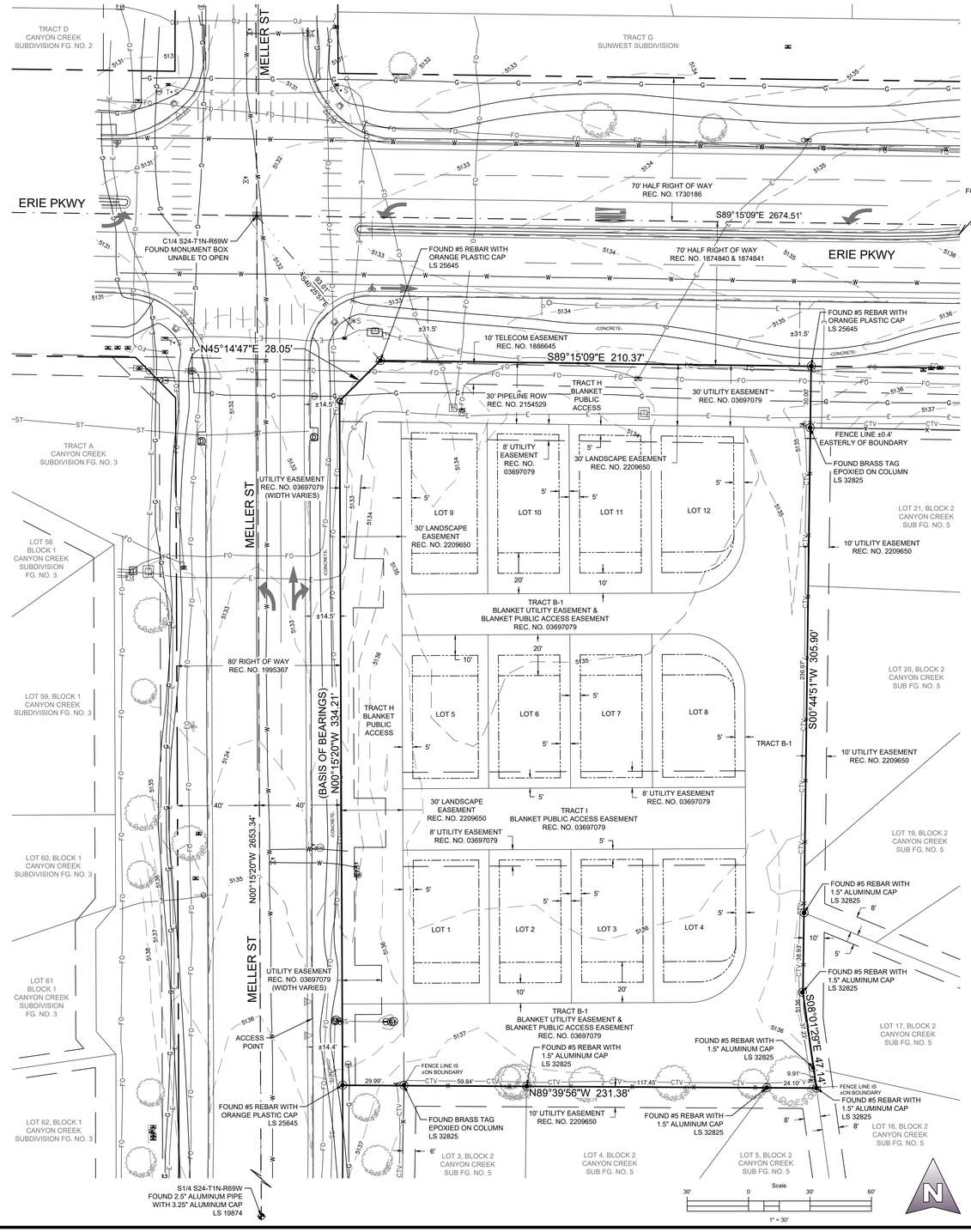
6) The lineal unit of measurement for this survey is U. S. Survey Feet.

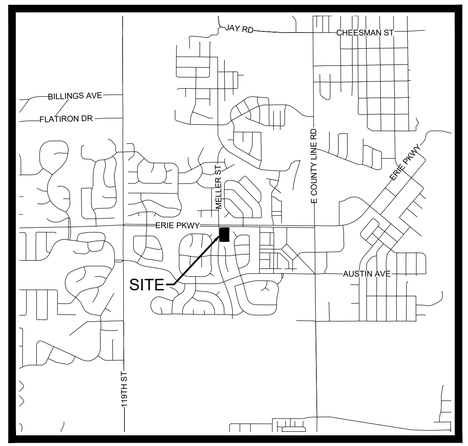
7) The Basis of Bearings is the West line of the Canyon Creek Subdivision Filing No. 5, 1st Amendment as bearing North 00°15'20" West a distance of 334.21' and monumented as shown on drawing.

8) Fieldwork was completed on July 2, 2025.

9) Site Addresses have not been established per Boulder County Records/Assessor Map.

10) Vertical datum is NAVD88 and NGS Benchmark "JR 53 5026" with a published NAVD88 elevation listed as 5028.0 feet and located with GPS at an elevation of 5028.30 feet was utilized in this survey.





VICINITY MAP
1" = 2000'

LINE LEGEND

- ALIQUOT LINE
- RIGHT OF WAY LINE
- ALTA BOUNDARY LINE
- EASEMENT LINE
- PROPERTY LINE
- SETBACK LINE
- DIMENSION LINE
- BURIED CABLE (CTV)
- BURIED WATER (W)
- UNDERGROUND STORM (ST)
- WOODEN FENCE (X)
- UNDERGROUND SANITARY (SS)
- BURIED FIBER OPTIC (FO)
- BURIED ELECTRIC (E)
- BURIED GAS (G)
- CURB & GUTTER FLOWLINE
- MAJOR CONTOUR
- MINOR CONTOUR

SYMBOL LEGEND

	FOUND SECTION CORNER
	FOUND PROPERTY MONUMENT AS DESCRIBED/NOTED HEREON
	SET PROPERTY MONUMENT SET 18" OF #4 REBAR WITH GREEN PLASTIC CAP, PLS 38670
	BOLLARD
CB	CABLE BOX
EB	ELECTRIC BOX
FO	FIBER OPTIC BOX
TB	TELEPHONE BOX
	CLEANOUT
	COLUMN
	CURBCUT
	FIRE HYDRANT
	SIGN
	WATER VALVE
D	STORM MANHOLE
S	SANITARY SEWER MAN HOLE
	LIGHT POLE
	WATER CURB STOP
IC	IRRIGATION CONTROL BOX
W	WATER METER
	TRAFFIC VAULT
T•S	TRAFFIC SIGNAL POLE
FO	FIBER OPTIC BOX
	HANDICAP RAMP
MH	WATER MANHOLE
G	GAS MARKER
FO	FIBER OPTIC MARKER
S	SANITARY MARKER
E	ELECTRIC PEDESTAL
FO	FIBER OPTIC VAULT
FO	FIBER OPTIC PEDESTAL
W	WATER MARKER

CALL UTILITY NOTIFICATION CENTER OF COLORADO
811 Know what's below. Call before you dig.
CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

UTILITY NOTE:
THE LOCATION OF UNDERGROUND UTILITIES AS SHOWN ARE BASED ON OBSERVED EVIDENCE AND UTILITY MARKINGS AT TIME OF SURVEY. ADDITIONAL UTILITY LINES MAY EXIST. THE EXACT LOCATION OF ANY UNDERGROUND UTILITIES SHOWN AND THE LOCATION OF ANY ADDITIONAL UNDERGROUND UTILITIES SHOULD BE DETERMINED BY CONTACTING "ONE CALL" FOR A UTILITY LOCATE.

SURVEYOR'S NOTES:

1) DISTANCES AROUND THE SUBJECT PARCEL MATCH RECORD DISTANCE, HOWEVER BEARINGS SHOWN WITHIN THE DRAWING MATCH LOCAL SITE CONDITIONS RELATIVE TO THE BASIS OF BEARINGS AND BASED UPON FOUND MONUMENTS. THOSE DISTANCES THAT DEVIATE FROM THE TITLE DESCRIPTION(S) HAVE BEEN SHOWN WITH A RECORD (R) AND MEASURED (M) DENOTATION.

2) THERE IS AMBIGUITY REGARDING TRACT I AND TRACT H RELATED TO BLANKET EASEMENTS. GENERAL NOTE #9 FROM CANYON CREEK SUBDIVISION FILING NO. 5, 1ST AMENDMENT STATE TRACT I AND TRACT H AS BLANKET PUBLIC ACCESS EASEMENTS ONLY, HOWEVER, THE "TRACT SUMMARY CHART" STATE TRACT I AND TRACT H AS "PUBLIC ACCESS AND UTILITY" UNDER USE. THIS HAS BEEN ASSUMED TO MEAN THAT WHILE THE USE IS CONSISTENT WITH PUBLIC ACCESS AS BLANKET, THE UTILITY EASEMENT IS ONLY RESERVED IN THOSE AREAS SPECIFICALLY PLATTED AND DELINEATED AS "UTILITY EASEMENT".

3) SETBACKS AS SHOWN ARE INTERPRETED VIA CANYON CREEK PD AMENDMENT NO. 7 (REC. NO. 03461707) AND BASED ON MDR ZONING. SETBACKS HAVE BEEN SHOWN ON ASSUMED FRONT YARDS FOR BOTH GARAGE AND BLDG (20' VS 10'). ALL OTHER SETBACKS ARE 5' FROM LOT LINE.

SURVEYING CERTIFICATE

To: BOWMAN CONSULTING GROUP LTD.

I, Aaron M. Lund, a Registered Professional Land Surveyor in the State of Colorado, do hereby state that this Land Survey Plat was prepared under my personal supervision and checking, and that it is true and correct to the best of my knowledge and belief. This is to certify that this map or plat and the survey on which it is based were made in accordance with the 2021 Minimum Standard Detail Requirements for ALTA/NSPS Land Title Surveys, jointly established and adopted by ALTA and NSPS and includes Items 1, 2, 4, 5, 6(a), 11(a), and 11(b) of Table A thereof. The fieldwork was completed on July 2, 2025.

COLORADO LICENSED
AARON M. LUND
7/11/2025
38670
PROFESSIONAL LAND SURVEYOR

For and on behalf of AXIS Surveying & Land Services, LLC
Aaron M. Lund
Registered Professional Land Surveyor LS 38670

AXIS SURVEYING
970.231.9501 WINDSOR, COLORADO
AXISSURVEYING.COM

SECTION 24 TOWNSHIP 1N RANGE 69W

NOTICE:
ACCORDING TO COLORADO LAW YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU DISCOVER SUCH DEFECT. IN NO EVENT MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF THE CERTIFICATE SHOWN HEREON.

NO.	DATE	DESCRIPTION	BY
1	07/11/25	ALTA/NSPS LAND TITLE SURVEY	SC

ALTA/NSPS LAND TITLE SURVEY

CANYON CREEK SUBDIVISION FILING NO. 5, 1ST AMENDMENT SITUATE WITHIN THE SE1/4 S24-T1N-R69W

Date 07/11/2025
Scale SC
Sheet No. 1/1
Job No. 006-25-012

EMERALD

DEVELOPMENT

Market Study: Proposed Commercial Center at Erie Parkway & Meller Street (Erie, CO)

This market study evaluates the viability of a small neighborhood commercial center at the intersection of Erie Parkway and Meller Street in Erie, Colorado. The center is intended to serve local merchants and nearby residents. The analysis covers local demographics, existing competition, consumer spending patterns, and traffic flows relevant to the site.

Demographics

Erie is a fast-growing community with a population of approximately 38,500 in 2025, up about 26% since the 2020 Census.

The town's growth rate (4–5% annually in recent years) is expected to continue, with forecasts of ~40,966 residents by 2028 (about 3.3% yearly growth).

This growth is fueled by an influx of families and professionals attracted to Erie's small-town feel and proximity to Denver/Boulder. The table below summarizes key demographic indicators for Erie:

Demographic Indicator	Value
Population (2025 est.)	38,503 (26.6% increase since 2020)
Projected Population (2028)	40,966 residents
Median Age	37.6 years
Population Under 18	≈31% of population
Population 65 and Older	≈9.6% of population
Number of Households	≈11,100 households
Average Household Size	2.9–3.0 persons
Median Household Income	$149,000–$163,000 (very high)

Per Capita Income	$62,726 per year
Persons Below Poverty Line	~3% (very low) censusreporter.org

The population is predominantly middle-aged adults and children. The median age (~37) is on par with Colorado overall (censusreporter.org), but over 30% of residents are under 18, indicating many families with children.

By contrast, only about 9–10% are senior citizens, lower than the national average, which underscores Erie's family-oriented demographics.

Households are relatively large (about 3 people on average) and 68% of adults are married, with 57% of households having kids under 18.

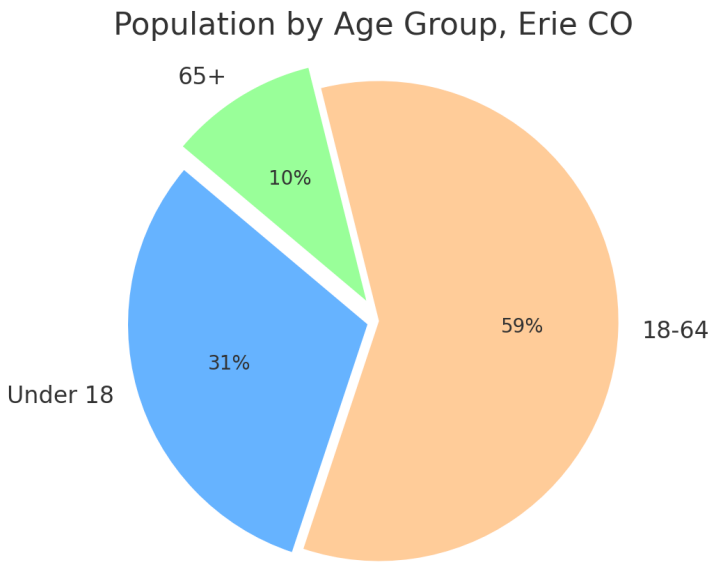
Educational attainment is high – roughly 65% of residents hold a bachelor's degree or higher, far above the Colorado average (~43%). These factors reflect a community of young, educated families.

Income levels in Erie are notably high. Median household income is in the $150K range, which is ~58% higher than the Denver metro median.

About half of households earn over $150,000 annually, and only ~5% earn below $25,000.

This affluence translates to significant **purchasing power** and disposable income among residents. The combination of a growing population, family-oriented age mix, and high incomes creates a strong customer base for neighborhood retail and services.

Source: U.S. Census & ACS data. Erie's population skews toward families – 31% are under 18 and only about 10% are seniors.



This age distribution (see chart) highlights a large youth cohort relative to the U.S. average, reflecting the many young families in the area.

Competition Analysis

Despite its growth, Erie has been **underserved in retail** – many residents currently travel to nearby towns for shopping and dining. However, new commercial developments are emerging. The proposed site at Erie Pkwy & Meller will face competition from both existing and upcoming retail centers in the vicinity. Key competing commercial areas include:

Commercial Center	Distance	Key Tenants / Features
Nine Mile Corner (Hwy 287 & Arapahoe Rd)	~4 miles SW	New regional shopping area on a high-traffic commuter route. Anchored by a 103,000 sq ft King Soopers grocery (opened Oct 2024) with an 18-pump fuel center, and a Lowe's home improvement store. Also includes eateries (Five Guys, Taco Bell) and services (UCHealth clinic).
Vista Ridge Marketplace (Hwy 7 & Sheridan Pkwy)	~5 miles SE	Established neighborhood center anchored by a King Soopers Marketplace (125,000 sq ft grocery/general merchandise store) opened in 2016. Offers a full line of groceries, pharmacy, and household goods to Erie's southeastern residents. Surrounding shops include fast food, banks, and small retailers.

Erie Town Center – "Four Corners" (Erie Pkwy & County Line Rd)	~1.5 miles W	*Planned* mixed-use town center at Erie's west end. Slated for ~97,000 sq ft of retail/restaurant/office space (opening ~2025), including an outdoor promenade and potentially an anchor grocery store (developer Evergreen Devco in negotiations). Will add much-needed retail capacity "at the heart of Erie."
Downtown Erie (Old Town) (Briggs St area)	~1 mile W	Traditional Main Street district with local boutiques, restaurants, brewpubs, and services. While charming and popular for dining, downtown lacks large-format retailers or grocery; its commercial space is mostly independent shops and eateries serving evening/weekend visitors.

Local Market Context: At present, Erie's **primary grocery options** are on its periphery – the two King Soopers stores at Nine Mile Corner and Vista Ridge. There is **no supermarket in central Erie**, meaning residents near the Meller site must drive several miles for full grocery trips. Other big-box retail (home improvement, general merchandise, apparel) is also found outside Erie (e.g. Lowe's at Nine Mile; Costco and Walmart at Larkridge, ~8 miles east). This relative scarcity of retail within the town has historically resulted in retail *"leakage"* – Erie consumers spending their dollars in neighboring communities. The new retail projects (Nine Mile, Town Center) aim to recapture some of that demand.

For a **small neighborhood center** at Erie Pkwy & Meller, the most direct competition will come from convenience-oriented offerings nearby. Currently, there are limited convenience retail options in the immediate area (e.g. a Circle K gas station opened 1 mile west.

The center could differentiate by focusing on community-serving businesses (local eateries, cafes, daycare, fitness, etc.) that cater to daily needs of residents in adjacent neighborhoods (like Canyon Creek and new subdivisions).

Old Town's restaurants are close by for evening outings, but day-to-day services are less prevalent. **In summary, the competition is relatively sparse within a 1–2 mile radius**, but larger centers 4–5 miles away provide many staples. This presents an opportunity for the proposed center to fill gaps in convenience retail and services for East-Central Erie residents, while coexisting with (rather than directly competing against) the big stores on the town's edges.

Consumer Spending Trends

Erie's affluent population translates into strong consumer spending potential across retail categories. With a median household income around $150K, local residents have high per-capita expenditures on groceries, dining, and discretionary retail. However, due to the limited retail in town, a large portion of this spending has been occurring outside of Erie.

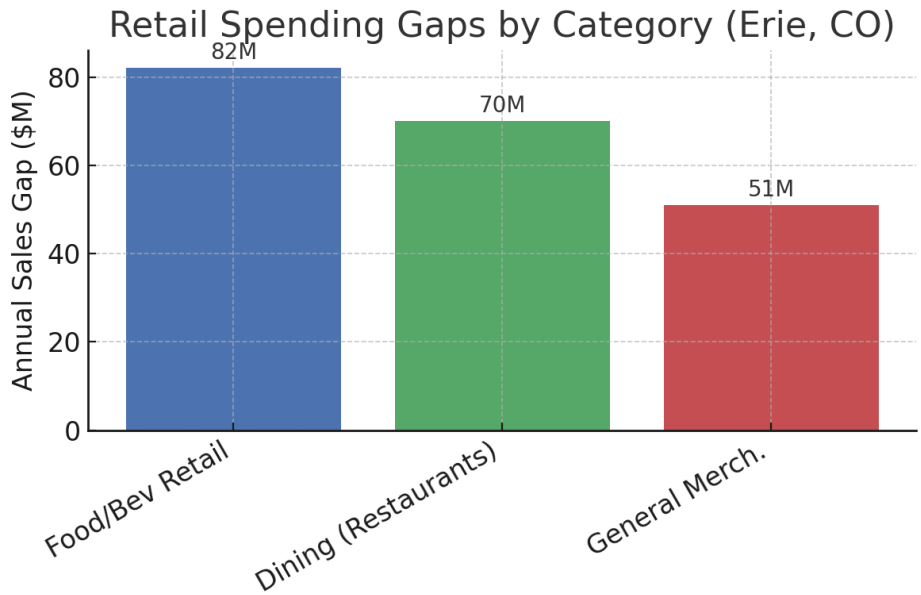
A recent market analysis found that Erie experiences an overall retail sales leakage of roughly 72% (net outflow) – in other words, local consumers are making the majority of their purchases in other communities. This represents a significant opportunity for new businesses at the Erie Pkwy/Meller site to capture some of that spending locally.

Estimates indicate that total annual retail demand by Erie residents is about $485 million, but the town sees a "gap" of approximately $407 million in sales that currently leak out.

The largest unmet needs are in everyday retail categories. For example, each year Erie households collectively spend an estimated $82 million on groceries (food & beverage stores), $70 million on dining out, and $51 million on general merchandise – much of which is spent at stores/restaurants in surrounding cities. These gaps are illustrated in the chart below. The existence of a full-service grocery store at Nine Mile (SW Erie) and another at Vista Ridge (SE Erie) will begin to address grocery needs, but there is still likely latent demand for specialty foods or a smaller market closer to central Erie. Likewise, the high spending on dining suggests strong support for additional restaurants, cafes, and take-out options locally.

Sources: Town of Erie market analysis and Community Profile

*The chart shows major **retail spending gaps** by category for Erie. "Gap" represents dollars that residents spend outside Erie due to lack of local options. Food & beverage (grocery) stores, restaurants, and general merchandise are the top categories with unmet local demand.*



Overall, Erie's **purchasing power** is well above average. Households spend generously on quality-of-life categories: organic and specialty groceries, family dining, entertainment, home and garden, etc. The presence of many young families also drives spending on childcare, education, and children's products/activities. A neighborhood center at Meller & Erie Pkwy can tap into this spending by providing convenient, everyday services. For instance, a coffee shop, neighborhood eatery, or fitness studio could thrive by capturing routine visits from nearby residents. Likewise, personal services (salon, pet care, dry cleaner) would benefit from the community's disposable income. In summary, **local consumer spending trends favor businesses that offer convenience and enhance daily life**, as residents have both the means and inclination to support such establishments close to home.

Traffic Analysis

Site Access & Visibility: Erie Parkway is the town's primary east–west arterial, connecting downtown Erie to Interstate 25 and serving as a major commuter route. The proposed site at Meller St is positioned along this busy corridor, providing excellent visibility and access. Erie Parkway carries an estimated 24,000–27,000 vehicles per day in the vicinity, reflecting both local and through traffic. This high traffic volume means a commercial center would benefit from a steady flow of passing vehicles throughout the day.

The intersection of Erie Pkwy and Meller is signalized, which will facilitate safe ingress/egress to the center. Meller Street itself is a residential collector road feeding the adjacent neighborhoods (e.g. Canyon Creek), so it brings local resident traffic to the site in addition to the parkway's cross-town traffic.

Traffic Counts: For context, key intersections nearby have substantial traffic: at Erie Pkwy & County Line Road (1.5 miles west) the AADT is ~24,300, and at Erie Pkwy & County Rd 5 (2 miles east) it's ~26,700.

The volume at Meller St would be in a similar range, indicating the site is on a well-traveled route. In regional terms, Erie Parkway sees heavy use as the link between **I-25 (110,000 AADT at the interchange) and Old Town Erie**.

The consistent traffic ensures a sizable customer **"drive-by" exposure** for any retail signage at the center.

Commuter and Local Patrons: During weekday mornings and evenings, commuter traffic is significant on Erie Pkwy as residents travel to and from work (Boulder/Denver). This could generate peak-hour business for uses like coffee shops (morning rush) and prepared foods or services (evening rush). Additionally, pedestrian and school traffic in the immediate area is noteworthy. Red Hawk Elementary School is located near the Erie Pkwy/Meller intersection, and a school crosswalk and zone are in place here.

At drop-off and pick-up times, many parents and children pass through, creating foot traffic and short-term parking needs. A neighborhood center could capitalize on this by offering kid-friendly shops (ice cream, after-school activities) or conveniences for parents (e.g. grabbing a coffee or groceries after school drop-off). The presence of the school means the site has built-in daytime population spikes and needs to maintain safe pedestrian access (crossing guards are already used at the intersection).

Accessibility: The site is readily accessible by car from all directions: Erie Parkway provides a straight shot from downtown and eastern Erie, while Meller connects to residential areas to the north and south. Ample **parking** can be provided on-site given the lot size (~1.8 acres). There are also bike lanes/paths along Erie Pkwy (per town transportation plans), encouraging some bike access from nearby homes. Public transit is minimal in Erie (no major bus route on Erie Pkwy currently), so the customer base will primarily arrive via private vehicle or on foot/bike from adjacent neighborhoods. Fortunately, the surrounding streets are **pedestrian-friendly**, with sidewalks and trail connections, making it feasible for residents to walk or cycle to the center for errands or dining.

Foot Traffic Potential: While Erie Parkway itself is a car-oriented arterial, the immediate community context (Canyon Creek and neighboring subdivisions) means a **built-in pedestrian audience** exists within a half-mile radius. The development can be integrated with **sidewalks and possibly trail linkages** to encourage nearby residents to visit on foot. For example, someone living a few blocks away might walk over for a quick lunch or to drop children at a daycare center. Peak pedestrian usage will align with school times and possibly weekends (neighbors walking to parks, etc.). Still, overall foot traffic will be moderate; the bulk of customers will arrive by car given Erie's suburban layout.

In summary, **traffic conditions at Erie Pkwy & Meller are favorable for a neighborhood commercial center**. High vehicle counts ensure visibility to thousands of drivers daily, and the adjacent school and housing provide a steady stream of local users. Proper traffic design (turn lanes, clear signage) will be important to manage ingress/egress on Erie Parkway's fast-moving traffic. If executed well, the site offers both the **convenience of a drive-by location** and the **community feel of a neighborhood hub** accessible to pedestrians. This combination of accessibility and visibility underpins the site's commercial potential.

Conclusion

Conclusion: The market indicators for the Meller & Erie Parkway site are strongly positive for a neighborhood-focused commercial center. Erie's booming population of young, affluent families creates robust demand for local retail and services, much of which is currently unmet within a convenient distance. The demographic profile – high incomes, lots of children, and ongoing growth – suggests that businesses like cafes, childcare, health/wellness, and everyday retail could thrive by catering to resident needs. Competitive supply in the immediate area is limited, with major shopping hubs several

miles away; this allows a new center to capture routine spending that might otherwise leak out. Key categories such as groceries, dining, and general merchandise show multi-million-dollar gaps that local shops can begin to fill. The new Erie Town Center and Nine Mile projects will increase retail in Erie, but they are larger-scale and further from this neighborhood; a smaller center at Meller can complement them by serving as a convenient "stop on the way home" for nearby households. Lastly, traffic and access dynamics at the site are favorable – thousands of cars pass daily and local foot traffic is enhanced by the school and residential density.

Overall, the analysis indicates that a well-planned commercial center at this location would be **commercially viable and community-serving**. By aligning the tenant mix with local spending patterns (family-oriented and convenience-based) and leveraging the strong traffic counts for exposure, the center can attract steady patronage from Erie residents. In effect, the project can help plug Erie's retail leakage by giving neighbors a place to shop, dine, and gather close to home, strengthening the town's economic base and quality of life.

EMERALD

DEVELOPMENT

ASSESSMENT OF IMPACT REPORT

Proposed Commercial Center at Erie Parkway & Meller Street

Date: March 2025

Project Overview

The proposed small commercial center at Erie Parkway and Meller Street is designed to serve the surrounding residential neighborhoods by providing retail, dining, and service-oriented businesses. The site will enhance local economic activity while maintaining a scale that aligns with the character of the community.

Traffic and Transportation Impact

The commercial center will generate additional traffic along Erie Parkway and Meller Street. However, given Erie Parkway's role as a primary arterial road, current capacity is expected to accommodate the increase without significant congestion issues. A traffic impact study confirms that:

- **Vehicle counts on Erie Parkway range from 24,000 to 27,000 per day**, ensuring strong visibility for businesses.
- **The intersection at Meller Street is signalized**, allowing for controlled ingress and egress.
- Minor traffic control improvements, such as stop sign adjustments and turn lane extensions, may be required and will be evaluated as part of the site development process.

Public Facilities and Services

The project will contribute to local infrastructure and municipal services through impact fees and planned improvements:

- **Law Enforcement & Emergency Services:** The Erie Police Department and local emergency response teams have confirmed their capacity to service the site without additional facilities.
- **Storm Drainage & Water Management:** Minor off-site drainage improvements may be required to handle runoff from paved surfaces, ensuring compliance with town stormwater regulations.
- **Parks & Open Space Contributions:** The project will include landscaped pedestrian walkways and contribute to the Town's parks and open space fund.

- **Estimated Contribution to Town Fees:** The development is expected to contribute over **$1.8 million in impact fees** to support infrastructure and services.

Utilities and Infrastructure

- **Electricity & Gas:** United Power has confirmed that sufficient capacity exists to support the project.
- **Water & Sanitary Services:** The site falls within the **Fort Collins-Loveland Water District** for water service and **Town of Erie** for sanitary sewer. Minor off-site sanitary infrastructure adjustments will be coordinated with the relevant agencies.
- **Waste Management:** Commercial waste and recycling services will be provided through a local waste management provider, with designated service areas planned within the site layout.

Mitigation Measures & Future Considerations

To minimize impact on surrounding neighborhoods and infrastructure, the project team will:

- Coordinate with the Town of Erie on **traffic calming measures** to maintain safe vehicular and pedestrian access.
- Implement **landscaping buffers and noise mitigation** for adjacent residential areas.
- Comply with **town sustainability guidelines**, including energy-efficient building design and water conservation measures.
- Continue discussions with town engineering and utility providers to address any **off-site improvements** needed for long-term service capacity.

Conclusion

The proposed commercial center at Erie Parkway and Meller Street aligns with the Town's development goals, providing **local retail and services in an accessible location** while generating economic benefits. With planned infrastructure coordination and mitigation measures, the project will enhance community convenience while maintaining compatibility with existing neighborhood characteristics.

Impact Fee Calculations

Calculation Basis

The **$1.8 million** estimate in the report was derived from:

- **Town of Erie's standard impact fee schedule** (updated in 2024).
- Comparable fees charged for recent small commercial developments in Erie.
- Estimated building square footage and land use type.

Example Calculation:

Assuming a **15,000 - 20,000 sq. ft.** neighborhood commercial center:

1. **Transportation Impact Fees**
   - ~$5.00 per sq. ft. → **$75,000 - $100,000**
2. **Water & Sewer Tap Fees** (Fort Collins-Loveland Water District & Erie Sanitary)
   - Standard tap fee per **1 ERU** (for a small business): ~$50,000
   - Estimated **12 - 15 ERUs** required → **$600,000 - $750,000**
3. **Stormwater Fees**
   - Based on impervious surface increase (~1.8-acre site)
   - Estimated **$150,000 - $200,000**
4. **Public Safety Fees**
   - ~$2.50 per sq. ft. → **$40,000 - $50,000**
5. **Parks & Open Space Contributions**
   - Either land dedication or cash-in-lieu (Town of Erie)
   - Estimated **$200,000 - $250,000**

3. Adjustments & Final Estimate

The final **$1.8M** estimate accounts for:

- A **10-15% contingency** for possible town-required off-site improvements.
- Potential **negotiations with the town** regarding reduced fees based on community benefits (e.g., local-serving businesses).

UTILITY CONFORMANCE LETTER
FOR
ERIE COMERCIAL SITE

ERIE, CO

Prepared for:

Emerald Developments

4949 Broadway Suite 105

Boulder CO 80304

Contact:

Dominic Schwartz

Prepared by:

1526 Cole Blvd, Suite 100

Lakewood, Colorado 80401

Contact: Patrick Chelin, PE

Phone: 303.801.2910

Project Number: 020482-01-001

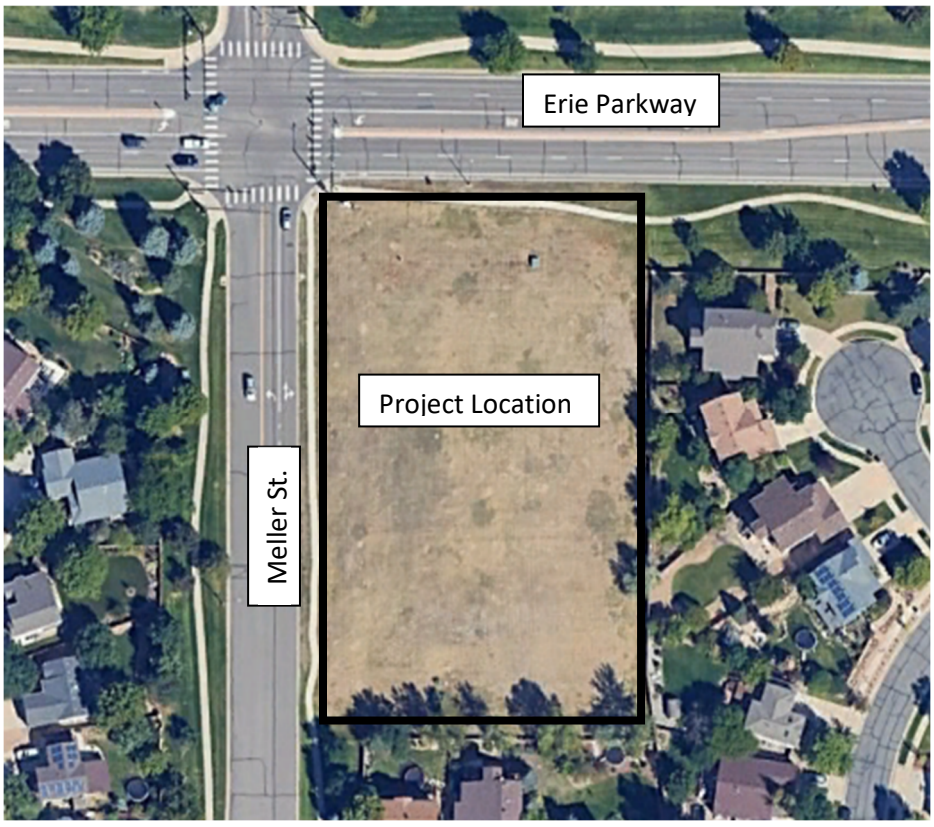
Prepared: July, 2025

GENERAL LOCATION AND DESCRIPTION

The Erie Commercial site is located in the Southeast Quarter of Section 24, Township 1 North, Range 69 West of the 6th Principal Meridian and takes up approximately 1.84-acres. The site is currently divided into 12 lots and will need to go through a Planning Development process as well as a zone lot amendment to combine the 12 lots into 1 lot.

The site is bounded on the north side by Erie Parkway, on the west side by Meller St. and a Canyon Creek residential neighborhood on the south and east side. Currently the site is undeveloped and covered with vegetation and native grasses. Proposed for the site are two single-story commercial buildings with parking, and infrastructure to support the development.

Erie Parkway has a 140' way right-of-way (ROW) with a 30' utility easement south of the property line. Meller St has an 80' ROW and with 30' landscape buffer adjacent to the property line. The east side of the lot will have a landscape zone to provide a buffer between the new development and the existing residential subdivision. The southside of the property has a 20' rear setback and will include landscaping to buffer the residential subdivision to the south.



DESIGN CRITERIA

The utility plan is designed in accordance with the Town of Erie "Standards and Specifications", revised March 2025. The two buildings will both be approximately 8,500 square feet. Preliminary sizing of the fireline and meters were determined using the IBC and IPC, each building is originally sized with a separate 6" fireline and 1" meters., The site will require two new fire hydrants, with the locations to be determined during the development process. The required fire flow for this site was calculated to be 1,500 gallons per minute (gpm) at a minimum residual pressure of 20 pounds per square inch (psi). This was based on the total fire area of the single largest sprinklered building (building 1 or 2: 8,500 (square feet) and type V-A construction.

The site is located at the upstream end of a sanitary sewer basin. Sanitary criteria states that d/D for sanitary systems to be less than 50%. The existing land that utilizes the a min has already been subdivided into 12 lots using the Town of Erie code of 2.89 persons per dwelling unit. It was calculated that the peak flow from the existing use is 0.019 cfs. Following the same code, it was determined that new use with 2 office buildings would have a peak flow of 0.011 cfs. With the new use being lower peak flow than the old land use, no negative impacts to the sanitary sewer line are expected.

CONCULSIONS

The utility plan was designed in accordance with Town of Erie "Standards and Specifications", revised March 2025. Calculations for the determination of sanitary flow can be found in the appendix on this report. The calculations were performed in accordance with the Town of Erie Standards.

Should you either require additional information or have any questions, please do not hesitate to contact me.

Sincerely,

Patrick D. Chelin, P.E.

Principle/Branch Manager

Cc: *020482-01-001*

ERIE PARKWAY

76' FL-FL

140.0' ROW

5' SWK

30.0' EXIST UTIL ESMT

EXISTING STORM

BUILDING 1
RETAIL
8500 SF
170 X 50'

EXIST LOT LINE

PROPOSED WATER CONNECTION & FIRE CONNECTION

MELLER STREET

25.0'

24.0'

30.0' LANDSCAPE BUFFER

24.0'

EXISTING WATER

9.0'

20.0'

BUILDING 2
RETAIL
8500 SF
50' X 170'

CANYON CREEK SUBDIVISION

80.0' ROW

PROPERTY LINE

50' FL-FL

CONNECT TO EXISTING WATER LINE

5' SWK

PROP 4" SAN SVC

CONNECT TO EXISTING SAN LINE

CURB CUT

24.0'

EXIST 8" SAN PVC

20.0' REAR SETBACK

CANYON CREEK SUBDIVISION

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

N

Bowman
Phone: (303) 801-2900
www.bowman.com
1526 Cole Blvd, Suite 100
Lakewood, CO 80401

REVISIONS

REVISION	DESCRIPTION	DATE
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SITE PLAN
ERIE COMMERCIAL
TOWN OF ERIE COLORADO

SEAL

NOT FOR CONSTRUCTION

DESIGN	DRAWN	CHKD
KMF	KMF	PDC

SCALE H: 1" = 20' V: NA

JOB No. 020482-01-001

DATE : JULY 2025

SHEET C1-01

Cad file name: V:\020482 – Erie Parkway and Meller Street\020482-01-001 (ENG)\Engineering\Engineering Plans\Site Plan\Site Plan.dwg

PROJECT NAME:	Erie Commercial
PROJECT NUMBER:	020482-01-001
PROJECT LOCATION	Town of Erie

SANITARY SEWER COMPUTATION SHEET

Date	Jul-25
Designed By	KMF
Checked By	

			PROJECTED FLOW																	SEWER DESIGN				
DESIGN POINT LOCATION	DESIGN POINT		RESIDENTIAL								COMERCIAL / INDUSTRIAL													
	FROM	TO	ZONING LAND USE	AREA (ACRES)	NO. OF UNITS	DENSITY	AVERAGE DAY DEMAND	FLOW FACTOR (GPAD)	AVERAGE FLOW (GPD)	AVERAGE FLOW (CFS)	ZONING LAND USE	AREA (ACRES)	BLDG SF	GPAD	GPD/1000 SF	AVERAGE FLOW (CFS)	TOTAL AVERAGE FLOW (CFS)	CALC PEAK FLOW FACTOR	PEAKING FACTOR	PEAK FLOW (CFS)	TOTAL PEAK FLOW (CFS)	PIPE SIZE (IN)	PIPE SLOPE (%)	CAPACITY (CFS)	PERCENT FULL
							90		0	0.000	C	1.84		1000		0.003	0.003	6.64	4.00	0.011		4	2	0.38	12.1

PROJECT NAME:	Exist Erie Commercial
PROJECT NUMBER:	020482-01-001
PROJECT LOCATION	Town of Erie

SANITARY SEWER COMPUTATION SHEET

Date	Jul-25
Designed By	KMF
Checked By	

			PROJECTED FLOW																	SEWER DESIGN				
DESIGN POINT LOCATION	DESIGN POINT		RESIDENTIAL								COMERCIAL / INDUSTRIAL													
	FROM	TO	ZONING LAND USE	AREA (ACRES)	NO. OF UNITS	DENSITY	AVERAGE DAY DEMAND	FLOW FACTOR (GPAD)	AVERAGE FLOW (GPD)	AVERAGE FLOW (CFS)	ZONING LAND USE	AREA (ACRES)	BLDG SF	GPAD	GPD/1000 SF	AVERAGE FLOW (CFS)	TOTAL AVERAGE FLOW (CFS)	CALC PEAK FLOW FACTOR	PEAKING FACTOR	PEAK FLOW (CFS)	TOTAL PEAK FLOW (CFS)	PIPE SIZE (IN)	PIPE SLOPE (%)	CAPACITY (CFS)	PERCENT FULL
					12	2.89	90		3121.2	0.005				1000		0.000	0.005	6.10	4.00	0.019		4	2	0.38	15.8

A.G. Wassenaar
Geotechnical and Environmental Consultants
Inc.
2180 South Ivanhoe Street, Suite 5
Denver, Colorado 80222-5710
303-759-8100 Fax 303-756-2920
www.agwassenaar.com

GEOTECHNICAL STUDY FOR

PROPOSED MULTI-FAMILY RESIDENTIAL STRUCTURES
SOUTHEAST OF ERIE PARKWAY AND MELLER STREET
ERIE, COLORADO

PREPARED FOR

VISION LAND CONSULTANTS, INC.
603 PARK POINT DRIVE, SUITE 100
GOLDEN, COLORADO 80401

SEPTEMBER 16, 2013
PROJECT NUMBER 132658

A.G. Wassenaar Inc.
Geotechnical and Environmental Consultants
2180 South Ivanhoe Street, Suite 5
Denver, Colorado 80222-5710
303-759-8100 Fax 303-756-2920
www.agwassenaar.com

September 16, 2013

Vision Land Consultants, Inc.
603 Park Point Drive, Suite 100
Golden, Colorado 80401

Attention: Mr. Lincoln Thomas

Subject: Geotechnical Study
Proposed Multi-Family Residential Structures
Southeast of Erie Parkway and Meller Street
Erie, Colorado
Project Number 132658

Dear Mr. Thomas:

We have conducted the geotechnical study for the proposed structures at the subject site. Our summary of the data collected during our field and laboratory work and our analysis, opinions, and conclusions are presented in the attached report. The purpose of our study is to provide design criteria for planning, site development, foundation systems, slabs-on-grade, and drainage for the proposed structures. Pavement design recommendations are also included.

In general, the subsurface materials encountered consist of fill overlying sedimentary bedrock. Sandstone and/or claystone bedrock was encountered at depths of 2 to 9 feet below the ground surface. Ground water was encountered at depths ranging from 4 to 26 feet during this study.

Site development considerations should include provisions for the presence of existing fill, expansive claystone bedrock, lignite (coal), and shallow ground water.

We recommend the structure be founded on straight-shaft piers drilled into competent bedrock. Design criteria are given in the report.

Slabs-on-grade will require special consideration because of the high expansion potential of the claystone bedrock.

Interior floor systems engineered for expansive soils are recommended for any areas where slab movement cannot be tolerated.

Perimeter subsurface drainage systems will be necessary for all below grade areas.

Foundation concrete may be designed for negligible (S0) sulfate exposure.

We recommend flexible pavements in parking areas consist of 6.0 inches of full-depth asphalt. The pavement section for service/drive areas should consist of 7.5 inches of full-depth asphalt. Additional composite asphalt/base course sections are given in the following report. An alternative rigid concrete pavement section of 5.0 inches is recommended for parking areas and 7.5 inches of concrete for service/drive areas. We also recommend pavement sections given for service/drive areas be thickened by 1 inch of asphalt or concrete in loading and unloading areas.

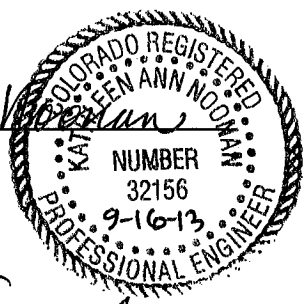
Additional recommendations are presented in the following report.

If you have any questions regarding the contents of this report or our analyses of the subsurface conditions which will influence the proposed development, please call us. We have appreciated the opportunity to provide this service for you.

Sincerely,

A. G. WASSENAAR, INC.

Kathleen A. Noonan, P.E.
Senior Engineer



Reviewed by:

Keith D. Seaton, P. E.
Senior Engineer

KAN/KDS/kan/lia

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

ATTACHMENTS

GEOTECHNICAL STUDY

Proposed Multi-Family Residential Structures
Southeast of Erie Parkway and Meller Street
Erie, Colorado
September 16, 2013

PURPOSE

This report presents results of a geotechnical study for the proposed multi-family residential structures and adjacent parking and drive areas to be located southeast of Erie Parkway and Meller Street in Erie, Colorado. The study was made to assist in determining design criteria for planning, site development, foundation systems, slabs-on-grade, and drainage. A pavement thickness design is also included. Factual data gathered during the field and laboratory work is summarized on Figures 1 through 14 and Table I, attached. Our opinions and recommendations presented in this report are based on the data generated during this field exploration, laboratory testing, and our experience with similar type projects.

PROPOSED CONSTRUCTION

We understand the proposed development will include a three, multi-family structures – two 4-plexes and one 5-plex and associated parking and drive areas. The construction details and materials were not known at the time of this study. The construction of basements was assumed. The approximate locations of our test borings are shown on Figure 1. For the purpose of this study, we have assumed the existing grade is within 2 feet of final construction grade.

SITE CONDITIONS

The parcel is bounded by Erie Parkway on the north, a residential subdivision on the east and south, and Meller Street on the west. The site has been previously graded to its present

configuration. The site is vacant with vegetation consisting of native grasses and weeds. The ground surface slopes gently to the north. No bodies of water or bedrock outcrops were observed on the site. There is a fill stockpile located on the western edge of the property.

FIELD EXPLORATION

Subsurface conditions were explored by drilling eight test borings within the proposed building footprint and one test boring in the drive areas at the approximate locations indicated on Figure 1. The borings were advanced using a 4-inch diameter, continuous flight auger powered by a CME 45 drill rig. At frequent intervals, samples of the subsurface materials were obtained using a Modified California sampler which was driven into the soil by dropping a 140-pound hammer through a free fall of 30 inches. The Modified California sampler is a 2.5-inch outside diameter by 2-inch inside diameter device. The number of blows required for the sampler to penetrate 12 inches and/or the number of inches that the sampler is driven by 50 blows gives an indication of the consistency or relative density of the soils and bedrock materials encountered. Results of the penetration tests and locations of sampling are presented on the "Exploratory Boring Logs", Figures 2 and 3. In addition, one shallow boring was drilled in pavement areas and a disturbed bulk bag sample was collected from the assumed pavement subgrade level. Ground water measurements were made at the time of drilling and subsequent to drilling.

LABORATORY TESTING

The samples obtained during drilling were returned to the laboratory where they were visually classified by a geotechnical engineer. Laboratory testing was then assigned to specific samples to evaluate their engineering properties. The laboratory tests included 17 swell-consolidation tests to evaluate the effect of wetting and loading on the selected samples. The results of the swell-consolidation tests are presented on Figures 4 through 12. Four gradation analysis and Atterberg

limits tests were conducted to evaluate grain size distribution and plasticity. These results are presented on Figures 13 and 14. In addition, a representative sample was tested for water soluble sulfates. The test results are summarized on Figures 2 and 3 and on Table I.

SUBSURFACE CONDITIONS

Our test borings indicate the subsurface materials encountered consist of fill overlying sedimentary bedrock. Sandstone and/or claystone bedrock was encountered at depths of 2 to 9 feet in eight of the nine test borings. Thin lenses and zones of lignite (coal) approximately 1 to 3 feet thick were encountered within the bedrock matrix at various depths. Ground water was encountered at depths ranging from 20 to 26 feet in three test borings at the time of drilling. When we returned six days later, ground water was encountered at depths ranging from 9 to 15 feet in eight of the test borings. Test Boring 6 caved at a depth of 10½ feet six days after drilling. A more complete description of the subsurface conditions is shown on Figures 2 and 3.

Fill was encountered in all of the test borings. The fill consisted of sandy clay and silty to clayey sand and was between 2 and 9 feet thick. It was very stiff/medium dense, moist, and mottled brown to mottled gray in color. Based upon our field and laboratory results, the fill exhibited in-situ dry densities ranging from 105 to 127 pounds per cubic foot (pcf) and in-situ moistures ranging from 10 to 20 percent (%). The sample tested was non-plastic. These soils also exhibited low to moderate measured swell (+0.1% to +2.3%) upon wetting and under a loading of 1,000 pounds per square foot (psf) and exhibited moderate swell (+4.0%) upon wetting and under a load of 200 psf. The existing fill encountered during this study has apparently not been placed as fill capable of supporting a structure or other structural elements. Unless documentation is available for the fill which verifies proper placement and compaction, the fill should be removed prior to placement of new fill, structures, flatwork, or other structural appurtenances.

Sandstone bedrock was encountered in eight of the nine test borings at depths ranging from 7 to 22 feet. The sandstone was very hard, poorly cemented, silty, clayey, with claystone lenses, moist, and brown to rust to gray in color. Based upon our field and laboratory results, the sandstone exhibited in-situ dry densities ranging from 115 to 119 pcf and in-situ moistures ranging from 11 to 12%. The sample tested exhibited low plasticity. The sandstone also exhibited low measured swell (+0.3% to +0.8%) upon wetting and under a loading of 1,000 psf. The sandstone is considered to possess low expansion potential.

Claystone bedrock was encountered in eight of the nine test borings at depths ranging from 2 to 26 feet. The claystone was weathered to very hard, silty, slightly sandy to sandy, with occasional lignite lenses, slightly moist to very moist, and olive to rust to brown to black to gray in color. Lignite lenses ranging from 1 to 3 feet thick were encountered in four test borings at depths ranging from 11 to 26 feet. Based upon our field and laboratory results, the claystone exhibited in-situ dry densities ranging from 92 to 131 pcf and in-situ moistures ranging from 11 to 28%. The samples tested exhibited moderate plasticity. The claystone also exhibited low to high measured swell (+1.6% to +5.6%) upon wetting and under a loading of 1,000 psf. The claystone is considered to possess high expansion potential.

Interbedded claystone and sandstone bedrock was found in two of the nine test borings at depths of 4 and 13 feet. It was firm to very hard, silty, moist, and olive to rust to brown to gray in color. Based upon our laboratory results, this material exhibited an in-situ dry density of 120 pcf at an in-situ moisture of 14%. The sample tested exhibited moderate plasticity. The interbedded claystone and sandstone bedrock exhibited low swell (+0.3%) upon wetting and under a loading of 1,000 psf. The claystone and sandstone portions of this bedrock should perform as previously discussed. As a mass, this material is assessed to possess moderate to high expansion potential.

Ground water was encountered at depths ranging from 20 to 26 feet in three test borings at the time of drilling. When we returned six days later, ground water was encountered at depths ranging from 9 to 15 feet in eight of the test borings. Test Boring 6 caved at a depth of 10½ feet six days after drilling. Ground water levels are expected to fluctuate with changing seasons and irrigations patterns and may rise after irrigation of lawns commences.

SITE CONSTRAINTS

EXISTING FILL

One of the main constraints for construction at the site is the presence of undocumented fill. Undocumented fill was encountered at depths of 2 to 9 feet in all of the test borings. Unless documentation is available for the fill which verifies proper placement and compaction, the fill should be removed prior to placement of new fill, structures, flatwork, or other structural appurtenances.

EXPANSIVE CLAYSTONE BEDROCK

Another concern for site development is the presence of expansive claystone bedrock. The claystone and interbedded claystone/sandstone bedrock are considered to possess moderate to high expansion potential. In our opinion, the expansive properties of the bedrock can be reduced with proper fill placement, drainage, future irrigation controls, and with the use of proper design and construction techniques.

LIGNITE

The use of straight shaft piers for foundation support will be made more difficult due to the presence of the lignite in the bedrock across the site. Lignite lenses ranging from 1 to 3 feet thick were encountered in four test borings at depths ranging from 11 to 26 feet. Our experience in

nearby subdivisions underlain by this formation indicates that the lignite in the bedrock can be very erratic in distribution, exhibiting itself in a random manner across the site. Since the material is not suitable for foundation support, its presence adds another level of uncertainty to the drilling of piers. Often lignite is encountered only in a portion of the piers for a structure. Where the lignite is wet, it must be cased to prevent caving and inflow of water. If it is encountered at the bottom of a long pier, it may not be possible to extend the pier through the lignite with the currently available residential drill rigs.

SHALLOW GROUND WATER

Ground water was encountered at depths ranging from 20 to 26 feet in three test borings at the time of drilling. When we returned six days later, ground water was encountered at depths ranging from 9 to 15 feet in eight of the test borings. Test Boring 6 caved at a depth of 10½ feet six days after drilling. Ground water will pose problems during utility construction, structure construction, and pavement construction. We typically recommend that foundations be constructed at least 3 or preferably 4 feet of more above ground water level. Site development should be planned to avoid or remove the ground water. These issues are also discussed more fully in the following sections.

FOUNDATION RECOMMENDATIONS

The proposed structures may be founded on straight-shaft piers drilled into the underlying bedrock. The piers should be designed for a maximum end bearing pressure of 30,000 pounds per square foot (psf) with a side shear of 3,000 psf for that portion of the pier in competent bedrock. No side shear should be used within the upper 12 feet of each pier, beginning beneath the grade beam or foundation wall. In addition, no side shear should be used for any portion of

the pier in natural soil or fill. The following criteria should be followed during design and construction of the piers:

1. A minimum dead load pressure of 15,000 psf based on pier cross-sectional area should be placed on each pier. Where minimum dead loads cannot be attained, minimum pier penetrations should be increased using the side shear value given above.
2. Piers should be drilled at least 8 feet or three pier diameters, whichever is greater, into the competent bedrock zone. Penetration into bedrock should not include zones of lignite (example: 12 feet of bedrock with 3 feet of lignite equals 9 feet of bedrock penetration). A minimum pier length of 25 feet is recommended in the basement and 29 feet in upper levels.
3. Pier tips must not be established in lignite. When lignite is encountered at the maximum pier depth, the pier must be extended through the lignite to the sandstone or claystone beneath.
4. All piers should be reinforced the full length to resist tension forces in addition to other structural loads. Piers should be reinforced to resist an ultimate uplift force resulting from a swelling pressure of 2,000 psf applied over a 12-foot length of pier minus the dead load imposed on the top of the pier by the structure.
5. A 6-inch minimum void space should be provided beneath the grade beams between the piers for effective concentration of loads on the piers.
6. To permit cleaning of each pier hole prior to placement of concrete, casing of the pier holes is anticipated because of ground water conditions. Concrete should not be placed by free fall methods in more than 3 inches of water.
7. In the event that casing is necessary, zones of caving material and/or cased bedrock should not be included when determining required bedrock penetrations.

Bedrock penetrations should be increased an amount equal to the length of caving and/or casing within the bedrock zone.

8. Concrete for each pier should be formed at the top of the pier, if necessary, to maintain a uniform diameter at the top of the pier.
9. Difficult drilling may be experienced in the very hard bedrock or where strongly cemented sandstone lenses are encountered. Pier penetration may only be decreased after a review of the design criteria and adequacy of the drilling equipment is conducted by this office and the Structural Engineer.
10. Pier drilling should be observed by a representative of this office to identify the bearing strata, to verify the subsurface conditions are as anticipated from our test borings, and to assess the construction.

LATERAL EARTH PRESSURES

Lateral pressures on foundation walls depend on such factors as the type of wall, hydrostatic pressure behind the wall, any horizontal swelling pressures, type and slope of backfill material, degree of backfill compaction, allowable wall movements, and surcharge loading conditions. Where anticipated wall movements are less than approximately 0.5 percent of the wall height or wall movement is constrained, lateral earth pressures should be estimated for an "at rest" condition. Where anticipated wall movements are greater than 0.5 percent of the wall height, lateral earth pressures should be estimated for an "active" condition. Walls backfilled with on-site sandy clay material should be designed for a lateral earth pressure based upon an equivalent fluid density of 75 pounds per cubic foot (pcf) for the "at rest" condition or 55 pcf for the "active" condition. If walls are backfilled with a free-draining granular backfill, such as a free-draining sand or gravel, equivalent fluid densities of 45 pcf for the "at rest" condition and 35 pcf for the "active" condition should be assumed. Passive resistance to lateral movement can be estimated based

on an equivalent density of 200 pcf. We recommend a coefficient of sliding resistance between the concrete and bearing soils of 0.30. These values have been provided without consideration for backfill sloping toward the foundation, surcharge loading or hydrostatic pressures. If any of these conditions are anticipated, we are available to assist in revising these values. Minor cracking of concrete foundation walls should be expected.

BASEMENT FLOOR CONSTRUCTION

A basement slab performance risk evaluation was conducted in general conformance with industry guidelines for the local area. The risk assessment of a site for potential movement is not absolute; rather, it represents a judgment based upon the data available and our experience in the area. Movement of foundations and concrete flat work will occur with time in low to very high risk areas as the soil moisture content increases. On low and moderate rated sites, slab movements of up to 3 inches or more across the slab with slab cracking of up to ¼-inch or more in width and/or differential are not unusual. The damage generally increases as the risk assessment increases and as the depth of wetting increases. It must be understood, however, that assessing risk is an opinion, and the prediction of heave is not an exact science. Therefore, it may be possible that heaves less than or in excess of what is described above may be experienced.

For sites with a risk assessment of high or very high, we recommend an interior floor system engineered for expansive soils be constructed. An alternative to the use of an engineered floor system, such as soil modification to reduce the risk assessment, may also be considered. **In addition, an engineered interior floor system is recommended for all finished areas or any other areas where floor movements cannot be tolerated.**

Based upon our evaluation of the subsurface conditions at this site, it is our opinion that the slab performance risk for this site is high. If this risk of movement is not acceptable, engineered interior floors should be constructed or an alternative such as soil modification should be considered.

If the Builder and/or Owner desires to construct a concrete slab-on-grade in unfinished non-habitable areas and accepts the risk of slab movement, slabs supported by the expansive subsurface materials should be constructed using the following criteria:

1. Slabs should be separated from exterior walls and interior bearing members with a joint which allows free vertical movement of the slab.
2. Slab bearing partitions should be constructed with a minimum 2-inch void space. Stairways bearing upon the slab should be constructed in such a way as to allow at least 2 inches of slab heave. In the event of slab heave, the movement should not be transmitted directly through the partitions to the remainder of the residence.
3. Plumbing and utilities should be isolated from the slab.
4. Where a forced-air heating system is used and the furnace is located on the slab, we recommend provision for a collapsible connection between the furnace and the duct work to allow for at least 3 inches of slab heave. Utility connections should also be provided with flexible connections capable of accommodating the same magnitude of movement as specified above.
5. Provide frequent control joints in the slab.

Following these recommendations will reduce immediate damage caused by movement of the floor slab; however, **the void spaces recommended are not intended to predict total slab**

movement. Care should be taken to monitor and reestablish partition voids and flexible connections when necessary. We are available to provide further consultation regarding basement slab performance risk assessments.

CRAWL SPACE CONSTRUCTION

The crawl space ground surface should be sloped to the perimeter drain system. Trenching or dishing out of the crawl space is not recommended unless a drain system is placed in these areas in such a manner to facilitate drainage. The recommended clearance from the crawl space ground surface to the engineered floor system should meet applicable codes as well as be increased by the recommended foundation void height. In addition, all plumbing lines should be isolated from the ground surface or foundation walls by at least the height of the previously recommended void thickness.

During construction, the crawl space area should be checked for standing water or very moist conditions, construction debris, and other deleterious materials. If these conditions exist, the area should be evaluated and mitigated, as necessary.

Crawl space areas should be constructed with consideration given to proper ventilation and moisture management. Provisions such as the installation of a vapor retarder should be utilized to reduce the amount of moisture (humidity) in the crawl space air. The Client and any future Owner should be aware that crawl space areas are subject to various air quality issues. A consultant specializing in ventilation and air quality control should be contacted to provide any additional recommendations. Such recommendations are beyond the geotechnical scope of this study. The environmental division of A. G. Wassenaar, Inc. is capable of providing such services.

Refer to "Homeowner's Guide To Moisture Management" by Tri-County Health Department (Brochure Number S-323) for additional information.

FILL PLACEMENT

Where fill soils are necessary under or around structural elements such as interior slabs, foundations, exterior flatwork, pavements (etc.), the on-site, inorganic materials may be used. The soil should be placed in 8-inch loose lifts, within -1 to +3 percent of optimum moisture content, and compacted to a minimum of 95 percent of Standard Proctor maximum dry density, according to ASTM D 698 for A-6 to A-7-6 soils. For all other soil types, the soils should be placed within -2 to +2 percent of optimum moisture content and compacted to a minimum of 95 percent of Modified Proctor maximum dry density according to ASTM D 1557. All topsoil, existing fill, and soil containing organic material should be removed beneath foundations, slabs, and future pavements. Off-site material considered for fill beneath structural elements should be evaluated by this office prior to importation. A guide specification for proper placement and compaction of fill is presented in the Appendix.

SURFACE DRAINAGE

The wetting of foundation soils and/or bedrock materials which causes heave may be reduced by carefully planned and maintained surface drainage. The following recommendations should be implemented during construction and maintained by the Homeowner's Association after the structures are completed:

1. Excessive wetting or drying of the open foundation excavation should be avoided as much as practical during construction.

2. The ground surface surrounding the exterior of the foundations should be maintained in such a manner as to provide for positive surface drainage away from the foundation. At completion of construction, we recommend a minimum fall away from the foundations of 6 inches in the first 5 feet. This slope should be continuous across the backfill zone.
3. Backfill around the foundations should be moistened and compacted in such a manner as to reduce future settlement. Areas which settle should be filled as soon as possible in order to maintain positive drainage away from the foundations.
4. If lawn edging is used around the exterior of the foundations, it should be constructed in a manner to prevent ponding of surface water in the vicinity of the backfill soils.
5. All drainage swales should be constructed and maintained a minimum of 5 feet away from the foundations on side yards and 15 feet away from the foundations on back and front yards. Drainage swales should maintain a slope of at least 2% off of the lot. Swales must not be blocked by fences, landscaping, paths or other homeowner installed items.
6. Roof downspouts and drains should discharge beyond the limits of foundation backfill.
7. Watering adjacent to the foundations should be reduced as much as practical. Landscaping which requires excessive watering should not be located within 5 feet of foundation walls. Main sprinkler lines, zone control boxes and drains should be located outside the limits of the foundation backfill. Sprinkler heads should be positioned such that the spray does not fall within 5 feet of foundation walls.

8. Plastic membranes should not be used to cover the ground surface immediately surrounding the foundation. These membranes tend to trap moisture and prevent normal evaporation from occurring. We recommend the use of a weed suppressant geotextile fabric.

SUBSURFACE DRAINAGE

As discussed previously, the level of the water table was measured at 9 to 15 feet in eight of the test borings six days after drilling. This is within 1 to 7 feet of our assumed basement floor level at the time of this study. During wetter seasons or wetter years, the water table may rise 3 feet or more depending on post-construction site conditions. Therefore, the basement floor level should be established as high as practical to reduce pumping of ground water. The foundation walls should be waterproofed and a subsurface drainage system provided. The drainage system should be constructed in accordance with one of the details shown in attached Figures 15 and 16. At least 6 inches of free-draining gravel should be placed below the basement floor level and connected to the perimeter drain system to reduce moisture transfer through the floor slabs and to assist in the collection of ground water.

If a sump pit is installed, it should be monitored for water accumulation and proper operation. The water level in the sump pit should not be allowed to rise above the foundation drain inlet pipe(s). If water rises above the inlet pipe(s), a pump should be installed (if not originally equipped), or maintenance should be performed on the existing pump.

These recommendations will provide a method for removal of free water that intersects the drain, however, will not eliminate the possibility of very moist soils or free water.

EXCAVATION DIFFICULTIES

In our opinion, the foundation and utility excavations may be constructed using conventional earth-moving equipment for the Denver area. No special problems are anticipated. For planning purposes, the on-site fill can be considered a 'Type C' soils and the underlying bedrock as a 'Type A' according to OSHA Regulation. A final determination of the soil type must be made by the Contractor's "Competent Person" (as defined by OSHA Regulation). Excavations should be properly sloped and/or braced. Local, state, and federal (OSHA) safety codes should be observed.

WATER SOLUBLE SULFATES

Laboratory tests conducted on a selected soil sample yielded water soluble sulfates of less than 100 parts per million (ppm). According to published information, foundation concrete which will be in contact with or within 6 inches of the natural soils may be designed for negligible (S0) sulfate exposure. We recommend the "ACI Manual of Concrete Practice", ACI 318, Section 4.3 of the most recent edition be used for proper concrete mix design properties as they relate to these conditions. The results are also presented on Figures 2 and 3 and on Table I.

PAVEMENT RECOMMENDATIONS

As previously mentioned, the shallow subgrade soils in proposed pavement areas consist of fill. According to AASHTO, these materials classify as A-2-4 soils with group indices of 8 and 13. No ground water or bedrock was observed in Boring 9 during this study.

Based upon the engineering characteristics of the subgrade soils, our understanding of site development and anticipated traffic, we recommend a full-depth asphalt or concrete section be used. For parking areas, a full-depth asphalt section would be 6.0 inches of asphalt. If a

composite section is desired, we recommend a minimum of 4.0 inches of asphalt over 7.0 inches of base course. For service/drive areas, a full-depth asphalt section would be 7.5 inches of asphalt. A composite section would be 4.5 inches of asphalt over 10.0 inches of base course. As an alternative, a rigid concrete pavement section of 5.0 inches is recommended for parking areas and 7.5 inches in service/drive areas. Because of the additional stress created by heavy trucks during starting/stopping and maneuvering at low speeds, we also recommend that pavement sections given for service/drive areas be thickened by 1 inch of asphalt or concrete in loading and unloading areas.

The above pavement thicknesses are for a design service life of approximately 20 years. If the subgrade becomes saturated and/or the actual traffic is greater than a DTN of 5 for parking lots or 20 for service drives and fire lanes, then the design service life will be less than 20 years. These recommendations generally meet the minimum design standards of the Town of Erie.

Asphalt binder selections should be appropriate for the anticipated traffic loadings. The contractor is responsible for review of this design and mix submittal. Testing conducted by this firm does not relieve the contractor from proper mix and binder selection. **Selection of the composite section option may reduce the possibility of longitudinal cracking parallel to the curb line.**

It has been our experience that water from landscape areas will infiltrate pavement subgrade soils and result in loss of subgrade integrity followed by pavement damage. Therefore, provisions should be made to maintain adequate drainage and/or contain runoff from such areas. This is especially important for composite pavement sections, which include base course and tend to promote further subgrade moisture infiltration and damage. In addition, water and irrigation lines should be thoroughly pressure tested for leaks prior to placement of pavement materials.

Prior to paving operations, the entire subgrade should be proof-rolled with a heavy rubber-tired vehicle (GVW of 50,000 pounds with 18 kip per axle at tire pressures of 90 psi) to detect any soft or loose areas. In areas where soft or loose soils, pumping or excessive movement is observed, the exposed materials should be overexcavated to a minimum depth of 2 feet below proposed final grade, or to a depth at which soils are stable. After this has been completed, the exposed materials should be scarified to a depth of 12 inches and moistened if necessary. The subgrade should then be uniformly compacted as outlined below.

The pavement subgrade should be scarified to a depth of 12 inches, moistened or aerated to dry, if necessary, and properly compacted immediately prior to pavement construction. The subgrade materials should be compacted to a minimum of 95 percent of Standard Proctor maximum dry density according to ASTM D 698, and within 0 to +4 percent of optimum moisture content for compaction for A-6 to A-7-6 soils. All other soil types should be compacted to a minimum of 95 percent of Modified Proctor maximum dry density according to ASTM D 1557, and within -2 to +2 percent of optimum moisture content for compaction.

Crushed aggregate base course materials, if used, should be compacted to a minimum of 95% of Modified Proctor maximum dry density according to ASTM D 1557. After the subgrade and base course have been placed, paving should commence as soon as possible in order to protect against moisture infiltration.

We recommend the use of CDOT Grading S or SX for asphalt pavements. The asphalt mix design should be approved by the Architect and/or municipality prior to placement. The asphaltic concrete surface should be placed in lifts a minimum of three times the particle size and compacted between 92% and 96% of Theoretical Maximum Specific Gravity.

The concrete should be obtained from an approved mix design with minimum properties for Class P concrete as recommended by the Colorado Department of Transportation. Concrete placement specifications should follow industry standards as recommended by the American Concrete Institute (ACI) and the Portland Cement Association (PCA).

Positive drainage off the parking and service/drive surfaces should be provided. As previously mentioned, construction materials should be evaluated by this office prior to use, and should be subsequently tested for compaction as these materials are being placed.

The Owner should anticipate and appropriately budget for maintenance operations. Maintenance is critical for any pavement structure. Proper maintenance including crack sealing, fog coats, patching, and structural overlays should be anticipated during the design life of this pavement. The timing of these maintenance operations is variable based on site conditions. Generally, fog coats are needed within the first three years. Crack sealing is generally needed within the first three years. Patching and structural overlays generally occur within eight to 12 years after initial construction.

The Owner should be aware that these recommendations were prepared utilizing local practices/standards. Highly plastic and expansive soils can pose a significant risk to pavement structures. This risk includes heave and cracking upon wetting. In addition, utility backfill settlement is a risk of development that can affect the pavement performance. Therefore, the Client should be aware that isolated to more wide-spaced damage may occur. For example, longitudinal cracking parallel to the curb line may be indicative of an expansive subgrade becoming wetted. Although the mechanisms are not fully understood, this cracking may be reduced if the aggregate base course option is selected. A solution typically used to reduce the

potential for such pavement distress is the removal of the subgrade materials to the depth of wetting, accompanied by subsequent replacement or reprocessing of the overexcavated subgrade materials. As this is generally economically unfeasible, this design may be used as an attempt to provide a reasonable cost-effective pavement structure.

We should evaluate and test the subgrade and pavement materials during construction to verify that our recommendations have been properly interpreted.

FINAL DESIGN CONSULTATION AND CONSTRUCTION OBSERVATION

This report has been prepared for the exclusive use of Vision Land Consultants, Inc. for the purpose of providing geotechnical criteria for the proposed project. The data gathered and the conclusions and recommendations presented herein are based upon the consideration of many factors including, but not limited to, the type of structures proposed, the configuration of the structures, the proposed usage of the site, the configuration of surrounding structures, the geologic setting, the materials encountered, and our understanding of the level of risk acceptable to the Client. Therefore, the conclusions and recommendations contained in this report shall not be considered valid for use by others unless accompanied by written authorization from A. G. Wassenaar, Inc.

It is recommended that A. G. Wassenaar, Inc. be retained to provide general review of the final design and specifications in order that the recommendations presented may be properly interpreted and implemented. Our firm should also be retained to provide geotechnical engineering and material testing services during construction of the site grading, utilities, and structures. The purpose is to observe the construction with respect to the geotechnical design

concepts, specifications or recommendations, and to facilitate design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

GEOTECHNICAL RISK

The concept of risk is an important aspect of any geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools which geotechnical engineers use are generally empirical and must be tempered by engineering judgment and experience. Therefore, the solutions or recommendations presented in any geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as desired or intended. What the engineering recommendations presented in the preceding sections do constitute is our best estimate, based on the information generated during this and previous evaluations and our experience in working with these conditions, of those measures that are necessary to help the development perform in a satisfactory manner. The Owner must understand this concept of risk, as it is they who must decide what is an acceptable level of risk for the proposed development of the site.

LIMITATIONS

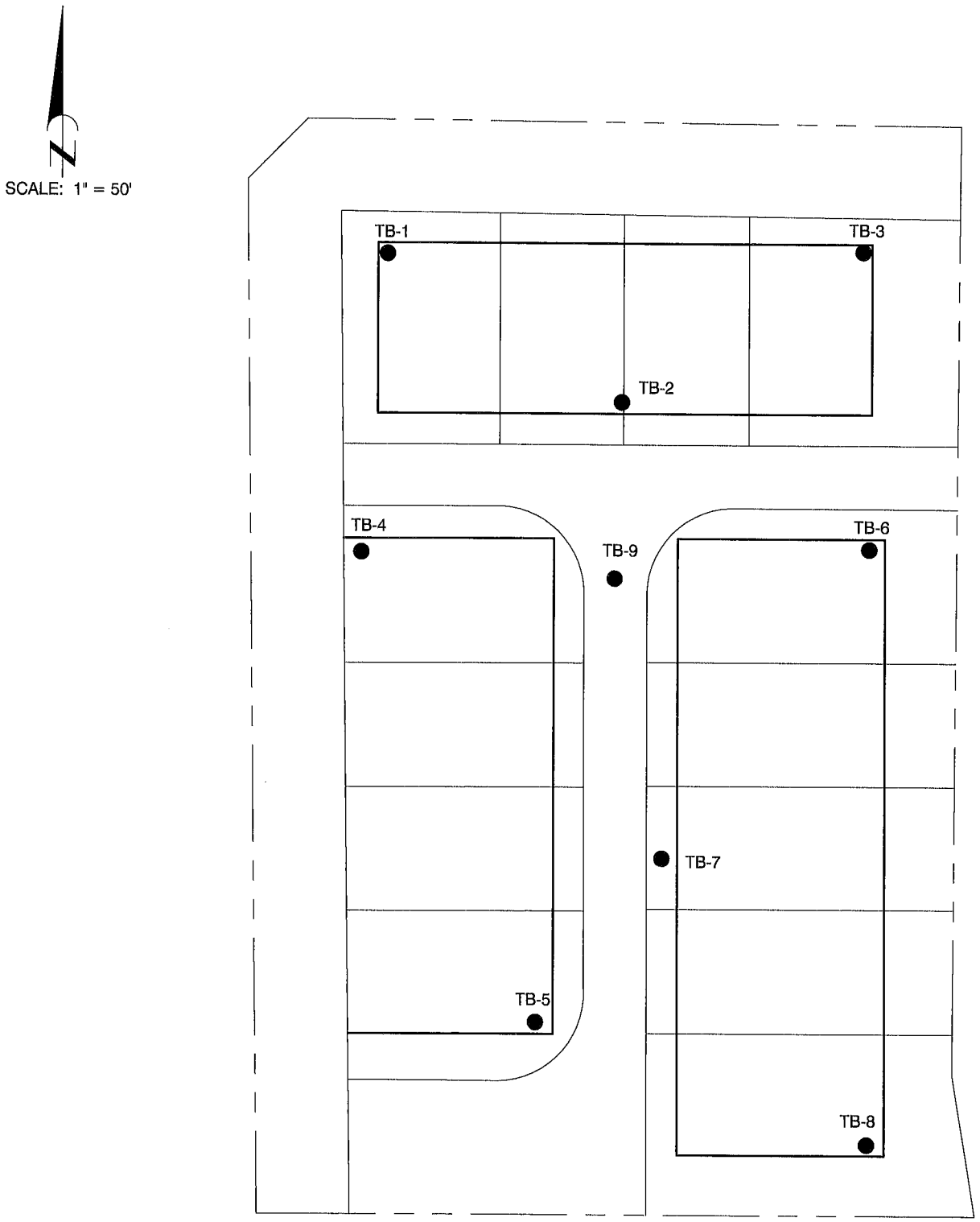
We believe the professional judgments expressed in this report are consistent with that degree of skill and care ordinarily exercised by practicing design professionals performing similar design services in the same locality, at the same time, at the same site and under the same or similar circumstances and conditions. No other warranty, express or implied, is made. In the event that any changes in the nature, design or location of the facility are made, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report are modified or verified in writing. Because of the

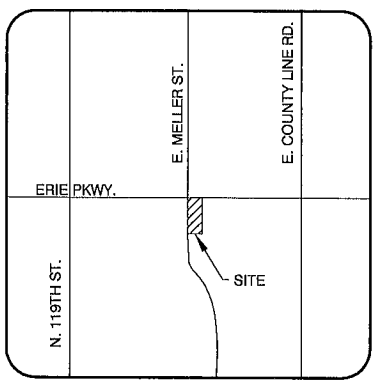
constantly changing state of the practice in geotechnical engineering, and the potential for site changes after our field exploration, this report should not be relied upon after a period of three years without our firm being given the opportunity to review and, if necessary, revise our findings.

The test borings drilled for this study were spaced to obtain a reasonably accurate picture of underground conditions for design purposes. Variations frequently occur from these conditions which are not indicated by the test borings. These variations are sometimes sufficient to necessitate modifications in the designs. If unexpected subsurface conditions are observed by any party during site development, we should be notified to review our recommendations.

Our scope of services for this project did not include, either specifically or by implication, any research, identification, testing, or assessment relative to past or present contamination of the site by any source, including biological (i.e., mold, fungi, bacteria, etc.). If such contamination were present, it is likely that the exploration and testing conducted for this report would not reveal its existence. If the Owner is concerned about the potential for such contamination or pollution, additional studies should be undertaken. We are available to discuss the scope of such studies with you.

Our scope of services for this project did not include a local or global geological risk assessment. Therefore, issues such as mine subsidence, slope stability, active faults, etc. were not researched or addressed as part of this study. If the Owner is concerned about these issues, we are available to discuss the scope of such studies upon your request.





VICINITY MAP
NOT TO SCALE

NOTE: ALL LOCATIONS ARE APPROXIMATE

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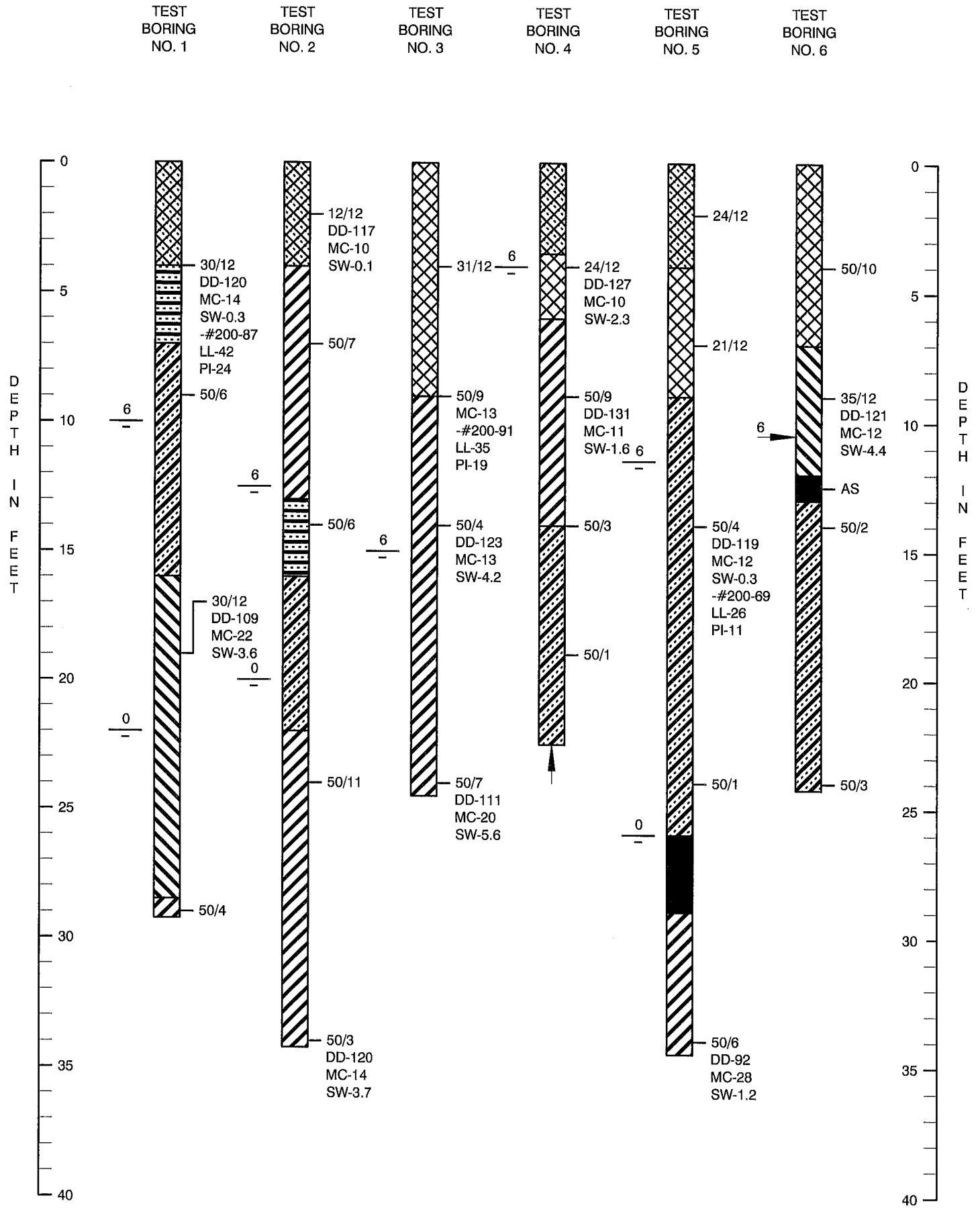
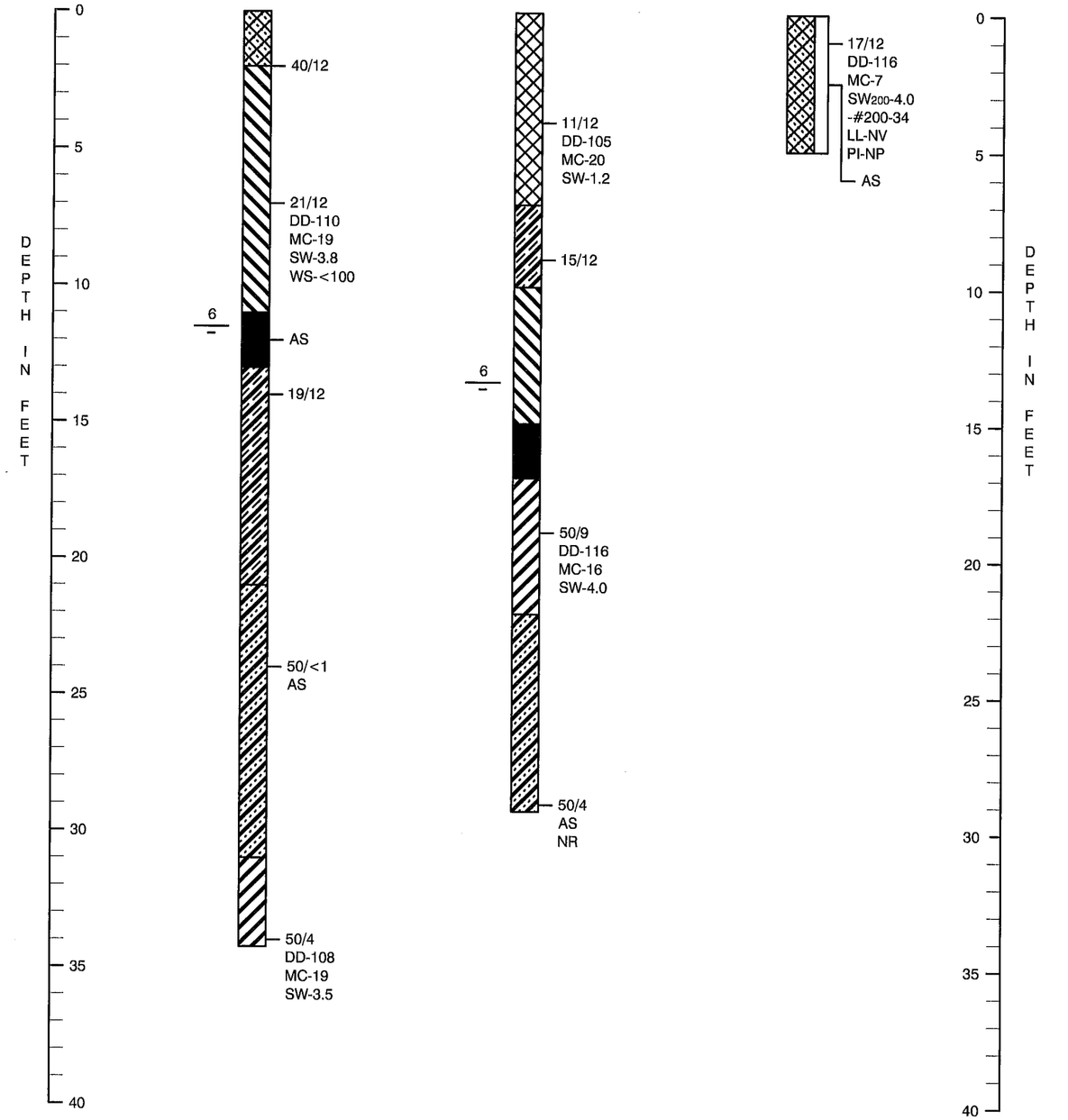
SITE PLAN & VICINITY MAP	PROJECT NO. 132658 FIGURE 1



SEE FIGURE 3 FOR LEGEND AND NOTES TO EXPLORATORY BORINGS

EXPLORATORY BORING LOGS
FIGURE 2

PROJECT NO. 132658



LEGEND

- FILL, CLAY, VERY STIFF, SANDY, MOIST, MOTTLED BROWN TO GRAY
- FILL, SAND, MEDIUM DENSE, SLITY TO VERY SILTY, CLAYEY, MOIST, MOTTLED BROWN
- CLAY (WEATHERED CLAYSTONE), STIFF, SILTY, SANDY, MOIST, GRAY TO RUST
- CLAYSTONE (BEDROCK), FIRM, SILTY, SLIGHTLY SANDY TO SANDY, WITH LIGNITE LENSES, SLIGHTLY MOIST TO MOIST, OLIVE TO RUST TO BROWN TO GRAY
- CLAYSTONE (BEDROCK), VERY HARD, SILTY, SLIGHTLY SANDY TO SANDY, WITH LIGNITE LENSES, MOIST TO VERY MOIST, GRAY
- SANDSTONE (BEDROCK), VERY HARD, POORLY CEMENTED, SILTY, CLAYEY, WITH CLAYSTONE LENSES,MOIST, BROWN TO RUST TO GRAY
- CLAYSTONE / SANDSTONE (BEDROCK), INTERBEDDED, FIRM TO VERY HARD, MOIST, OLIVE TO RUST TO BROWN TO GRAY
- LIGNITE, BLACK
- 30/12 — INDICATES THAT 30 BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE A 2.5-INCH OUTSIDE DIAMETER SAMPLER 12 INCHES.
- 0 / – — INDICATES THE DEPTH TO THE FREE WATER TABLE AND THE NUMBER OF DAYS AFTER DRILLING WHEN THE MEASUREMENT WAS TAKEN.
- 6 / – — INDICATES THE DEPTH AT WHICH THE TEST BORING CAVED AND THE NUMBER OF DAYS AFTER DRILLING WHEN THE MEASUREMENT WAS TAKEN.
- AS — INDICATES DEPTH AT WHICH AUGER SAMPLE WAS RECOVERED.
- INDICATES DEPTH AT WHICH PRACTICAL DRILLING REFUSAL WAS ENCOUNTERED.

NR	INDICATES NO SAMPLE RECOVERED
DD	INDICATES DRY DENSITY OF SAMPLE IN POUNDS PER CUBIC FOOT
MC	INDICATES MOISTURE CONTENT AS A PERCENTAGE OF DRY WEIGHT OF SOIL
SW	INDICATES PERCENT SWELL UNDER A SURCHARGE OF 1000 PSF UPON WETTING
SW_{200}	INDICATES PERCENT SWELL UNDER A SURCHARGE OF 200 PSF UPON WETTING
COM	INDICATES PERCENT COMPRESSION UNDER A SURCHARGE OF 1000 PSF UPON WETTING
-#200	INDICATES PERCENT PASSING THE NO. 200 SIEVE
LL	INDICATES LIQUID LIMIT
PI	INDICATES PLASTICITY INDEX
NP	INDICATES NON-PLASTIC
NV	INDICATES NO VALUE
WS	INDICATES WATER SOLUBLE SULFATES IN PARTS PER MILLION

NOTES

1. TEST BORINGS WERE DRILLED AUGUST 7, 2013 WITH A 4-INCH DIAMETER, CONTINUOUS FLIGHT POWER AUGER.
2. LOCATIONS OF TEST BORINGS WERE STAKED BY OTHERS AT LOCATIONS CHOSEN BY THIS FIRM.
3. THE HORIZONTAL LINES SHOWN ON THE LOGS ARE TO DIFFERENTIATE MATERIALS AND REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN MATERIALS. THE TRANSITIONS BETWEEN MATERIALS MAY BE GRADUAL.
4. DRILL LOGS SHOWN IN THIS REPORT ARE SUBJECT TO THE LIMITATIONS, EXPLANATIONS, AND CONCLUSIONS OF THIS REPORT.

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EXPLORATORY BORING LOGS

PROJECT NO. 132658
FIGURE 3

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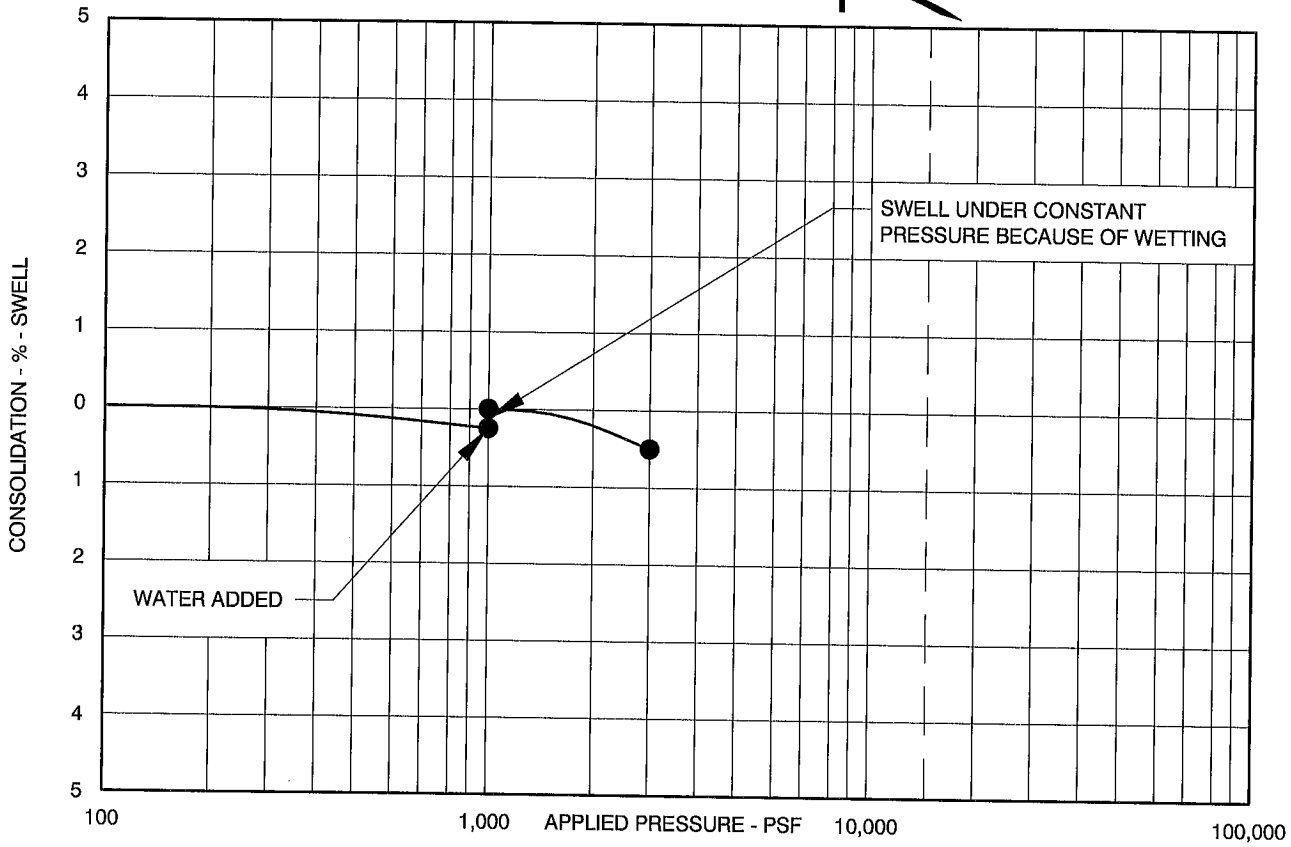
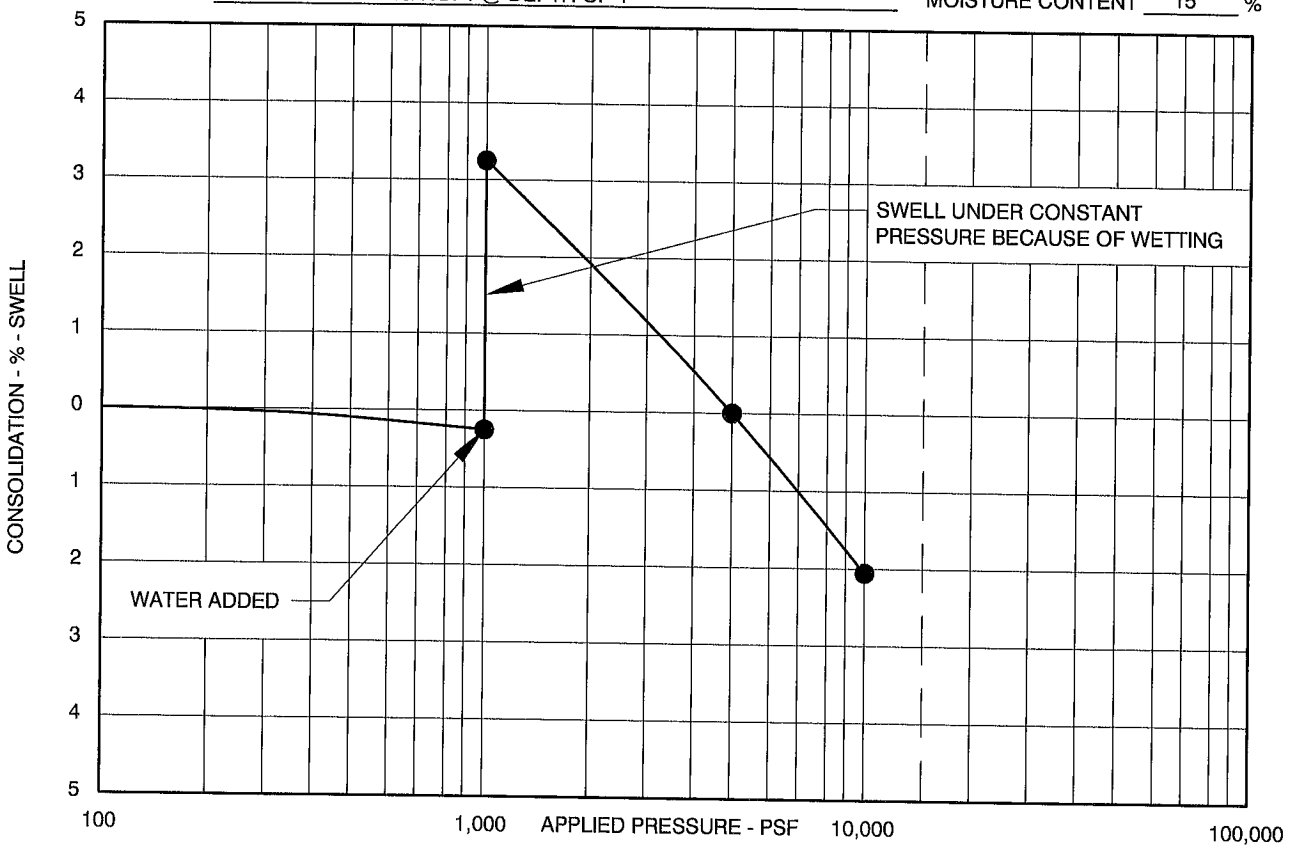


SAMPLE DESCRIPTION CLAYSTONE, SLIGHTLY SANDY
LOCATION TEST BORING NO. 1 @ DEPTH OF 4'

DRY UNIT WT. 120 PCF
MOISTURE CONTENT 15 %



SAMPLE DESCRIPTION CLAYSTONE, SILTY
LOCATION TEST BORING NO. 1 @ DEPTH OF 19'

DRY UNIT WT. 109 PCF
MOISTURE CONTENT 22 %

SWELL - CONSOLIDATION TEST RESULTS

FIGURE 4

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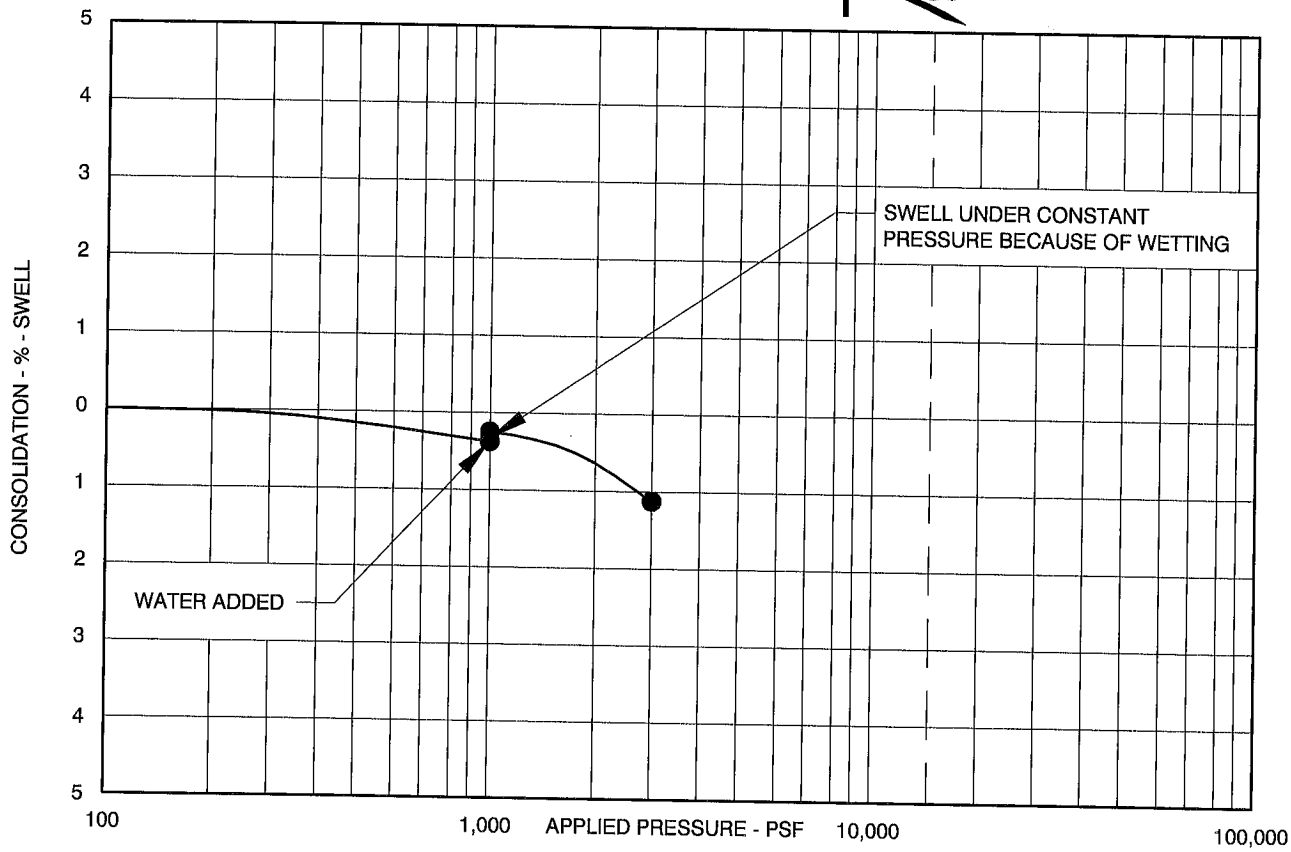
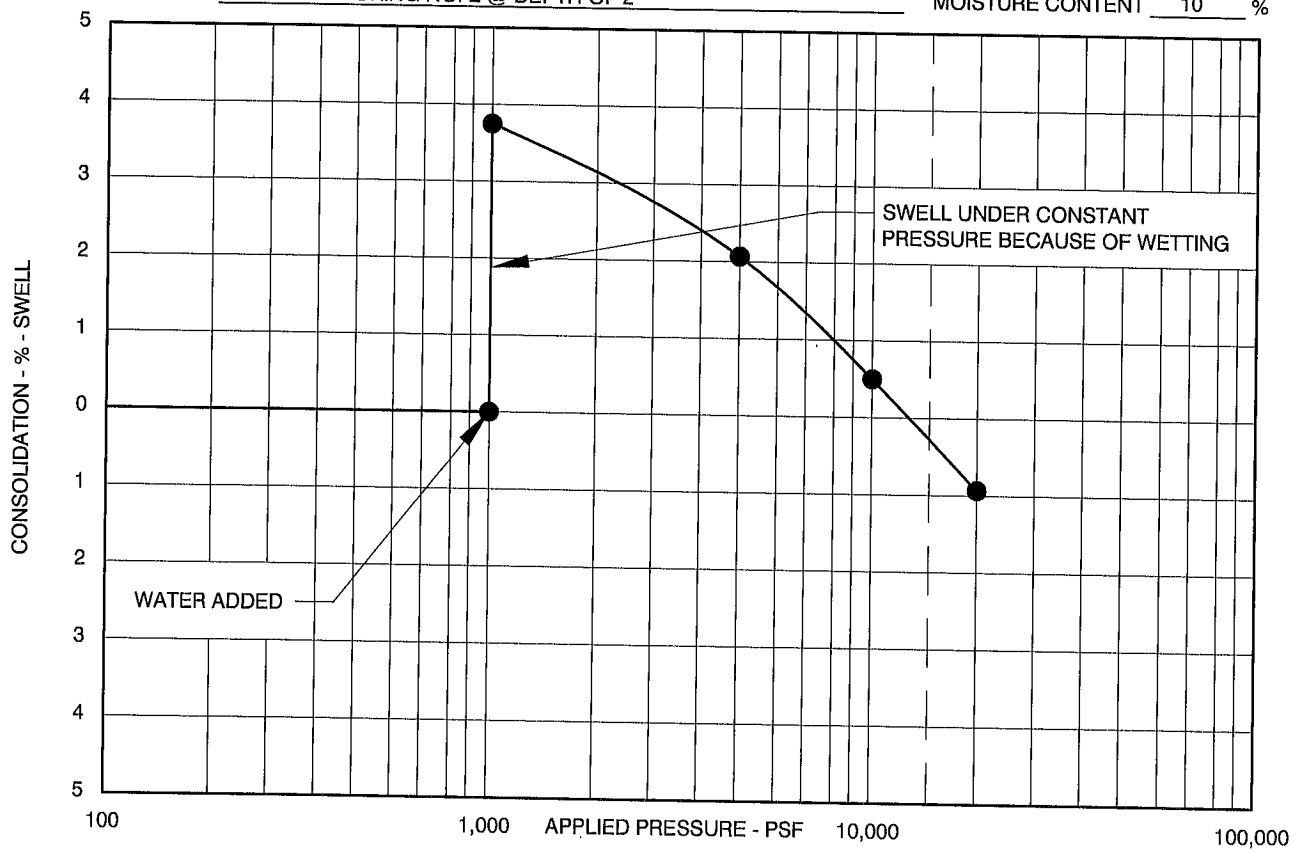


SAMPLE DESCRIPTION FILL, CLAY, SANDY
LOCATION TEST BORING NO. 2 @ DEPTH OF 2'

DRY UNIT WT. 117 PCF
MOISTURE CONTENT 10 %



SAMPLE DESCRIPTION CLAYSTONE, SILTY
LOCATION TEST BORING NO. 2 @ DEPTH OF 34'

DRY UNIT WT. 120 PCF
MOISTURE CONTENT 14 %

SWELL - CONSOLIDATION TEST RESULTS

FIGURE 5

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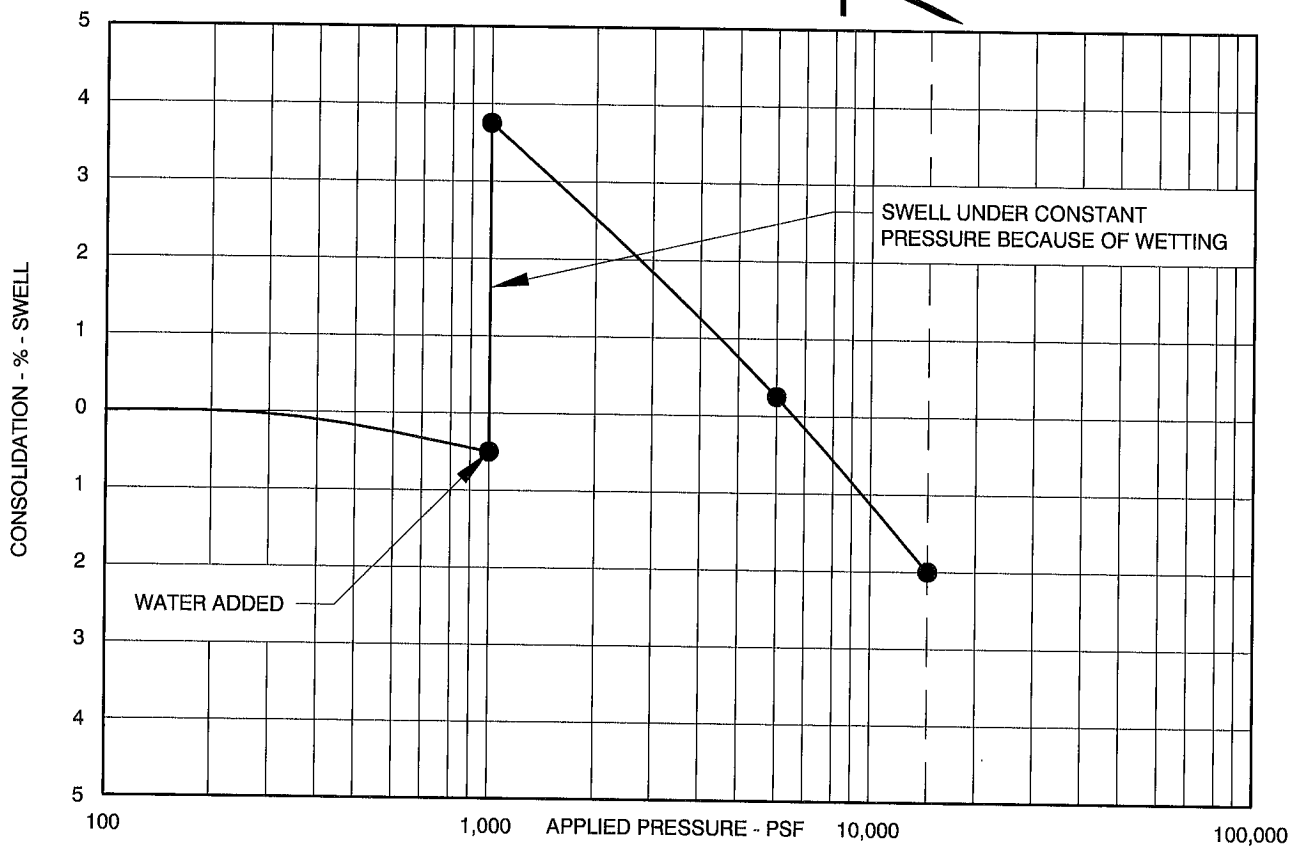
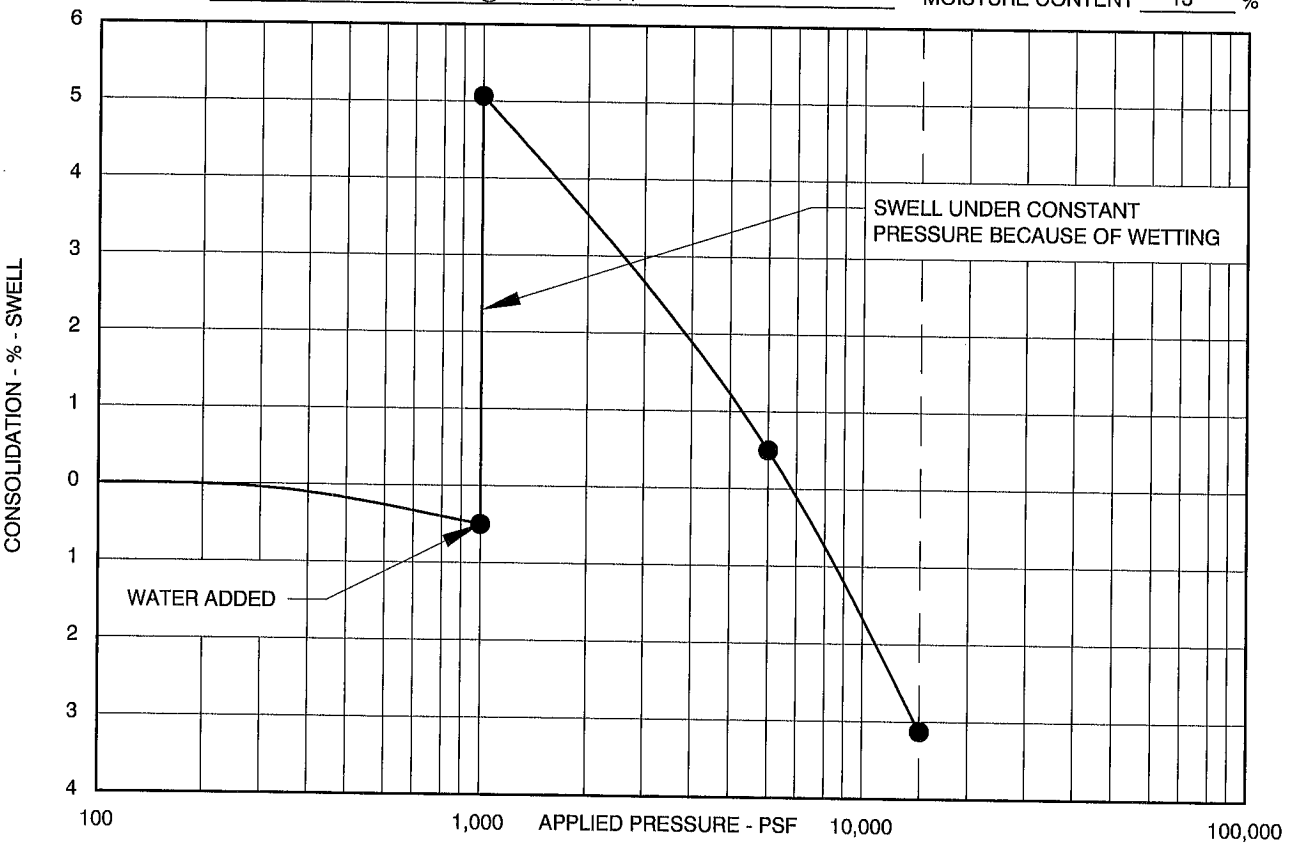


SAMPLE DESCRIPTION CLAYSTONE, SLIGHTLY SANDY
LOCATION TEST BORING NO. 3 @ DEPTH OF 14'

DRY UNIT WT. 123 PCF
MOISTURE CONTENT 13 %



SAMPLE DESCRIPTION CLAYSTONE, SILTY
LOCATION TEST BORING NO. 3 @ DEPTH OF 24'

DRY UNIT WT. 111 PCF
MOISTURE CONTENT 20 %

SWELL - CONSOLIDATION TEST RESULTS

FIGURE 6

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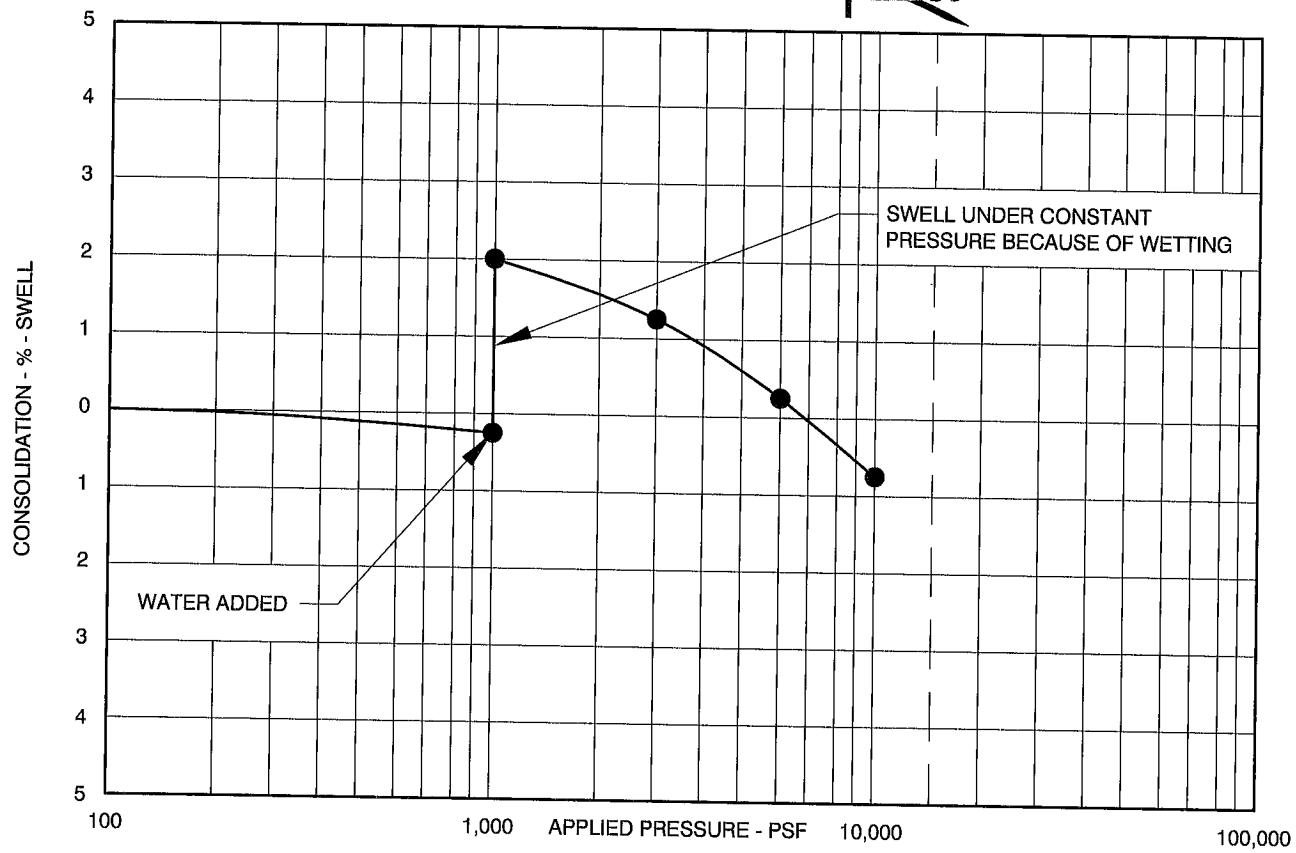
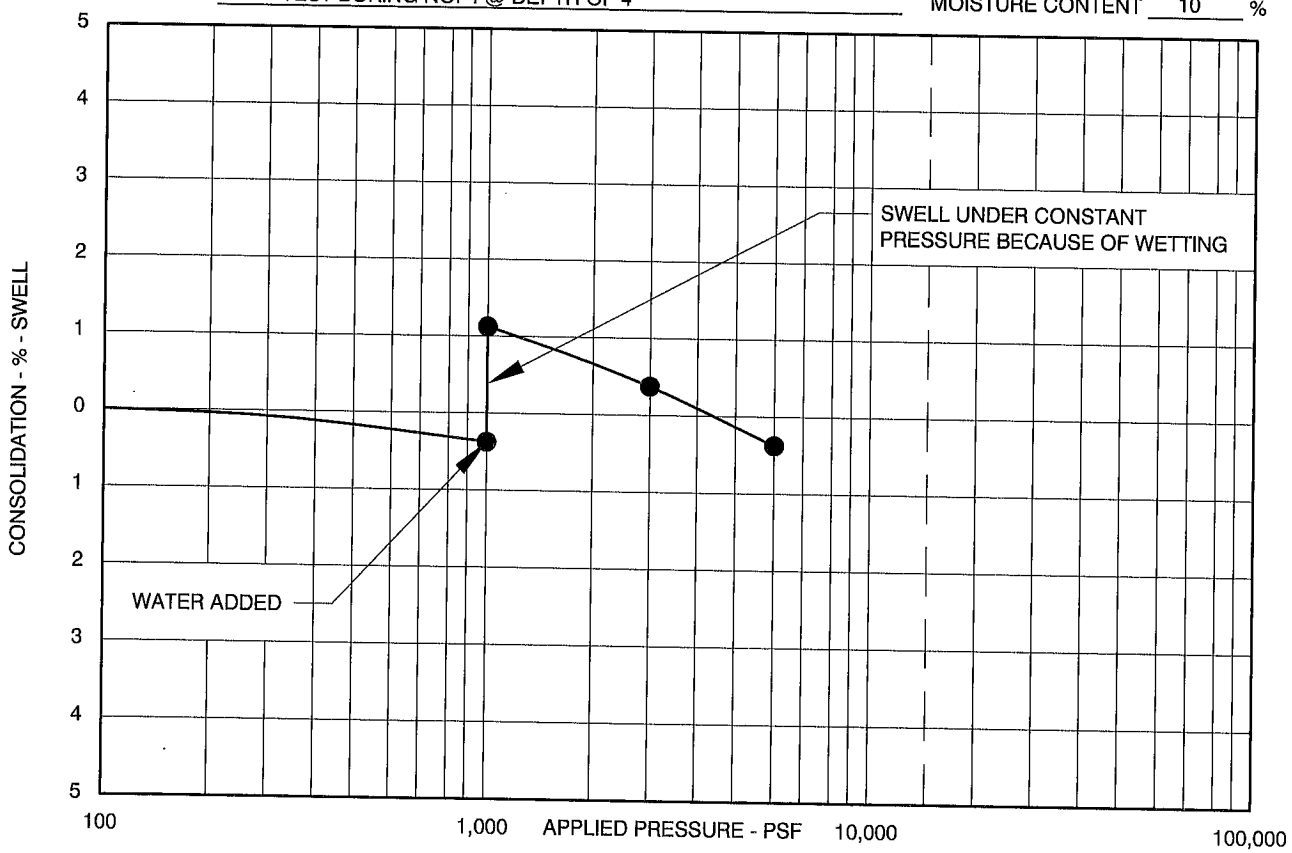


SAMPLE DESCRIPTION FILL, CLAY, SANDY
LOCATION TEST BORING NO. 4 @ DEPTH OF 4'

DRY UNIT WT. 127 PCF
MOISTURE CONTENT 10 %



SAMPLE DESCRIPTION CLAYSTONE, SILTY
LOCATION TEST BORING NO. 4 @ DEPTH OF 9'

DRY UNIT WT. 131 PCF
MOISTURE CONTENT 11 %

SWELL - CONSOLIDATION TEST RESULTS

FIGURE 7

PROJECT NO. 132658

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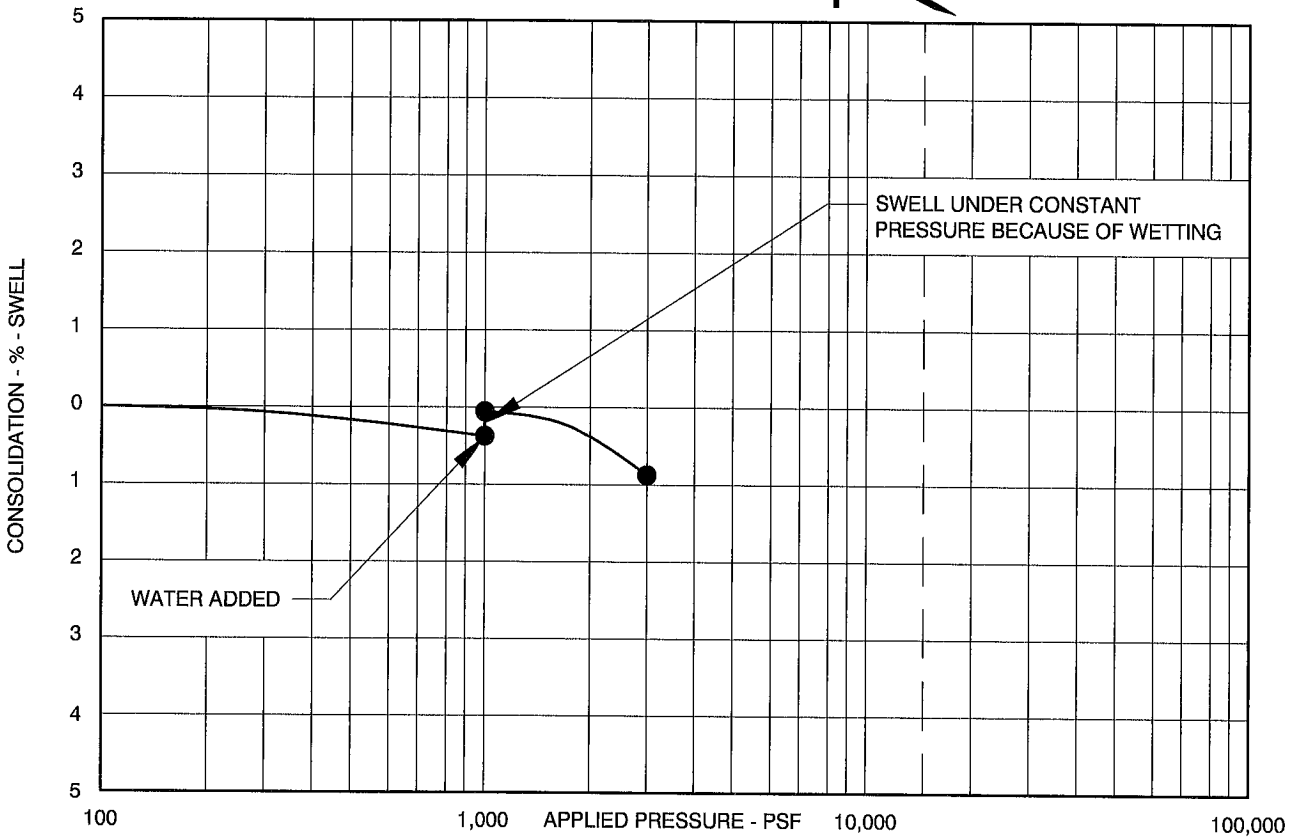
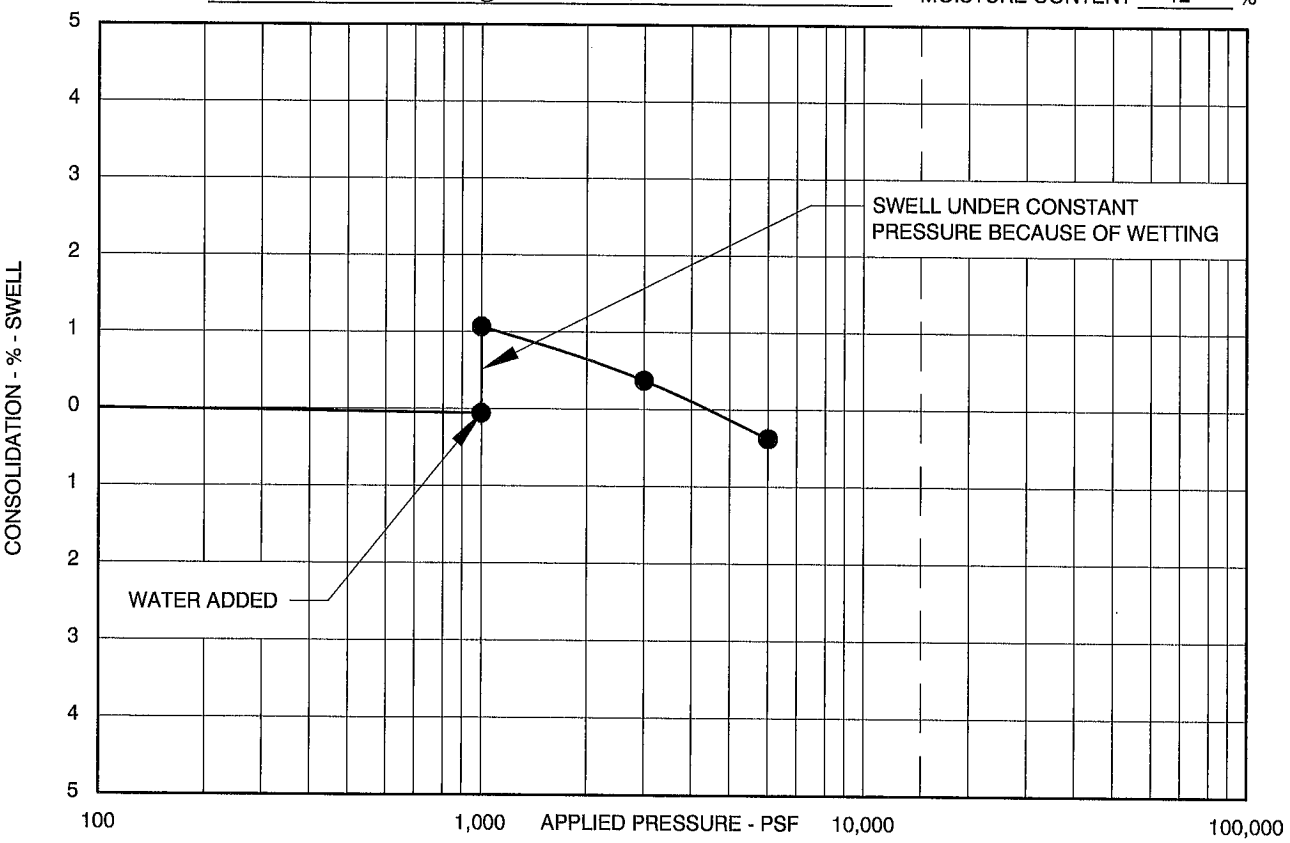


SAMPLE DESCRIPTION CLAYSTONE, SANDY
LOCATION TEST BORING NO. 5 @ DEPTH OF 14'

DRY UNIT WT. 119 PCF
MOISTURE CONTENT 12 %



SAMPLE DESCRIPTION CLAYSTONE, SILTY
LOCATION TEST BORING NO. 5 @ DEPTH OF 34'

DRY UNIT WT. 92 PCF
MOISTURE CONTENT 28 %

SWELL - CONSOLIDATION TEST RESULTS

FIGURE 8

PROJECT NO. 132658

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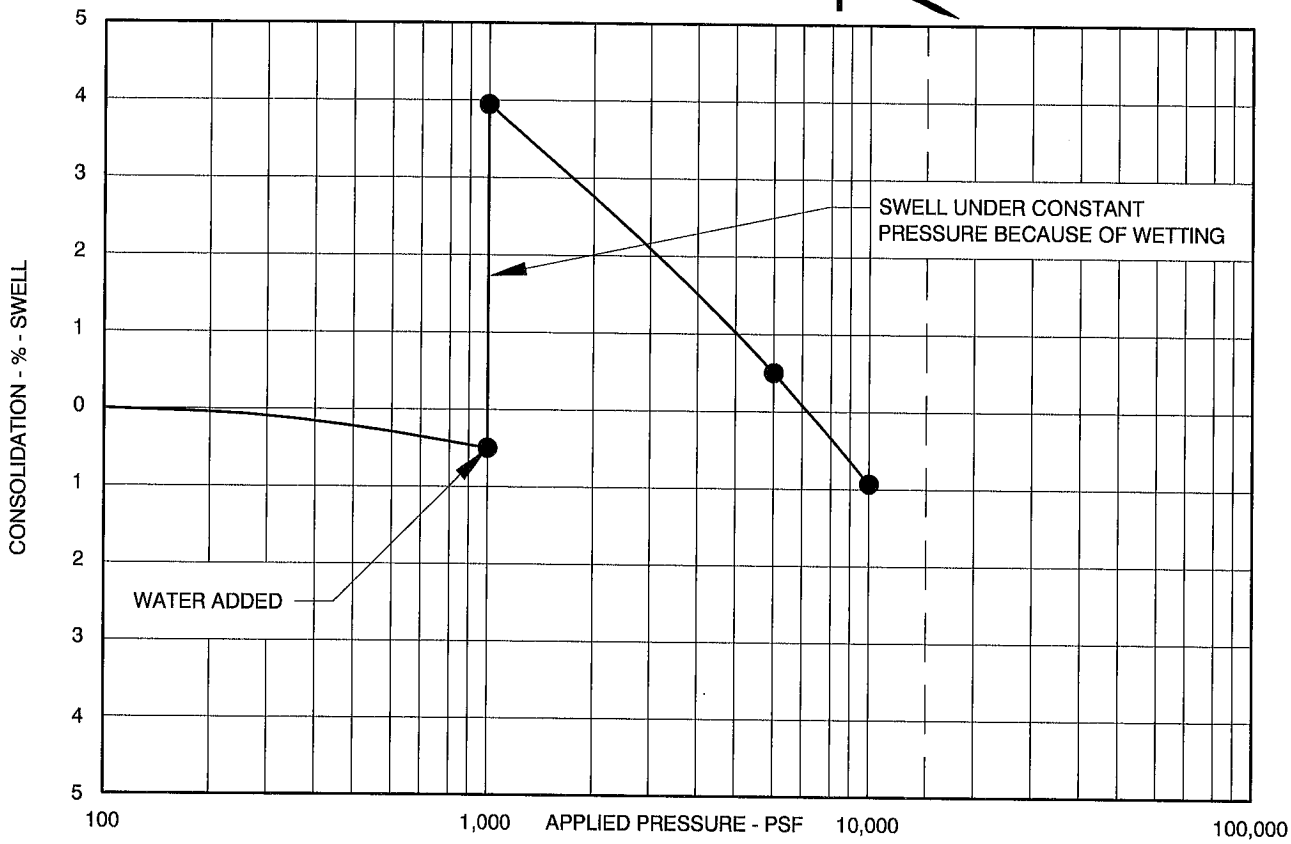
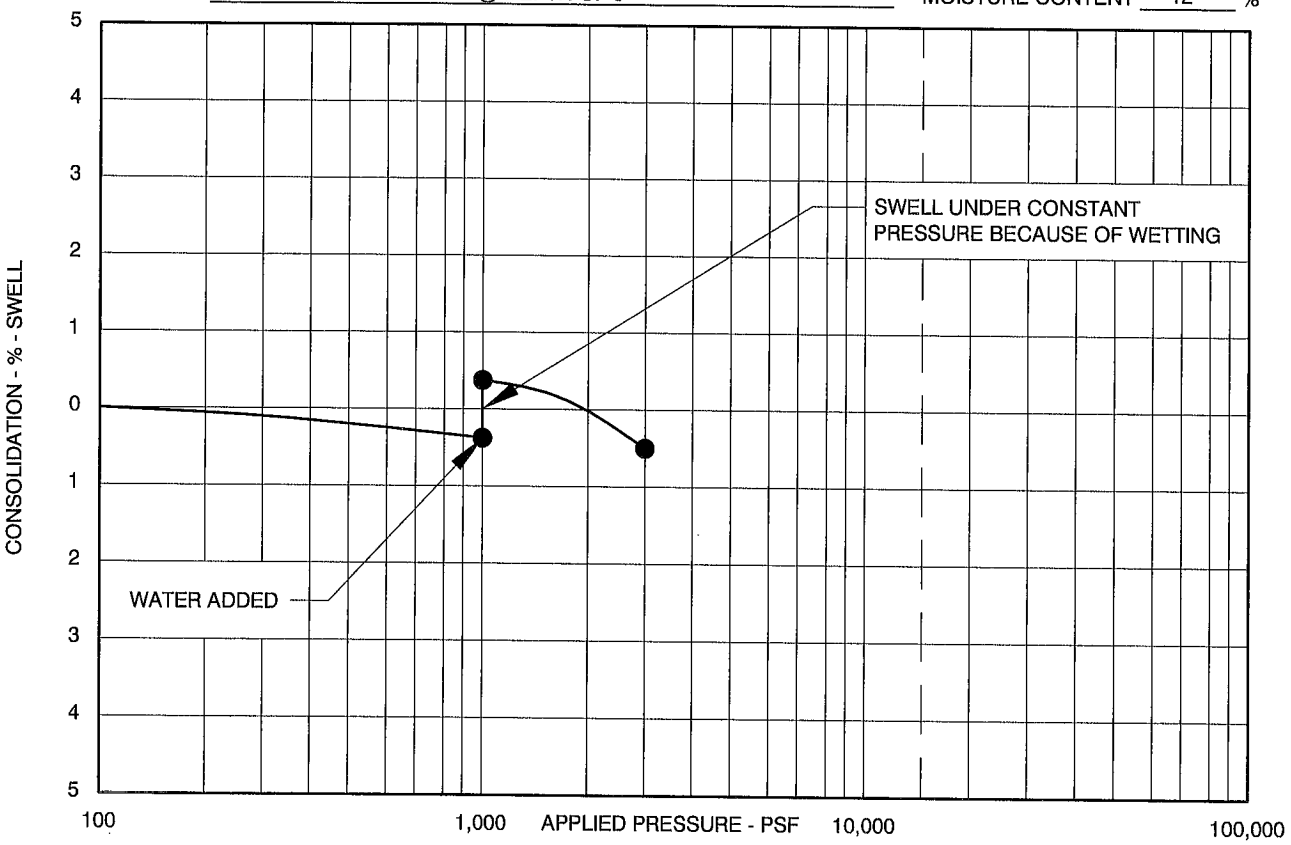


SAMPLE DESCRIPTION CLAYSTONE, SILTY
LOCATION TEST BORING NO. 6 @ DEPTH OF 9'

DRY UNIT WT. 121 PCF
MOISTURE CONTENT 12 %



SAMPLE DESCRIPTION SANDSTONE, CLAYEY
LOCATION TEST BORING NO. 6 @ DEPTH OF 24'

DRY UNIT WT. 115 PCF
MOISTURE CONTENT 11 %

SWELL - CONSOLIDATION TEST RESULTS

FIGURE 9

PROJECT NO. 132658

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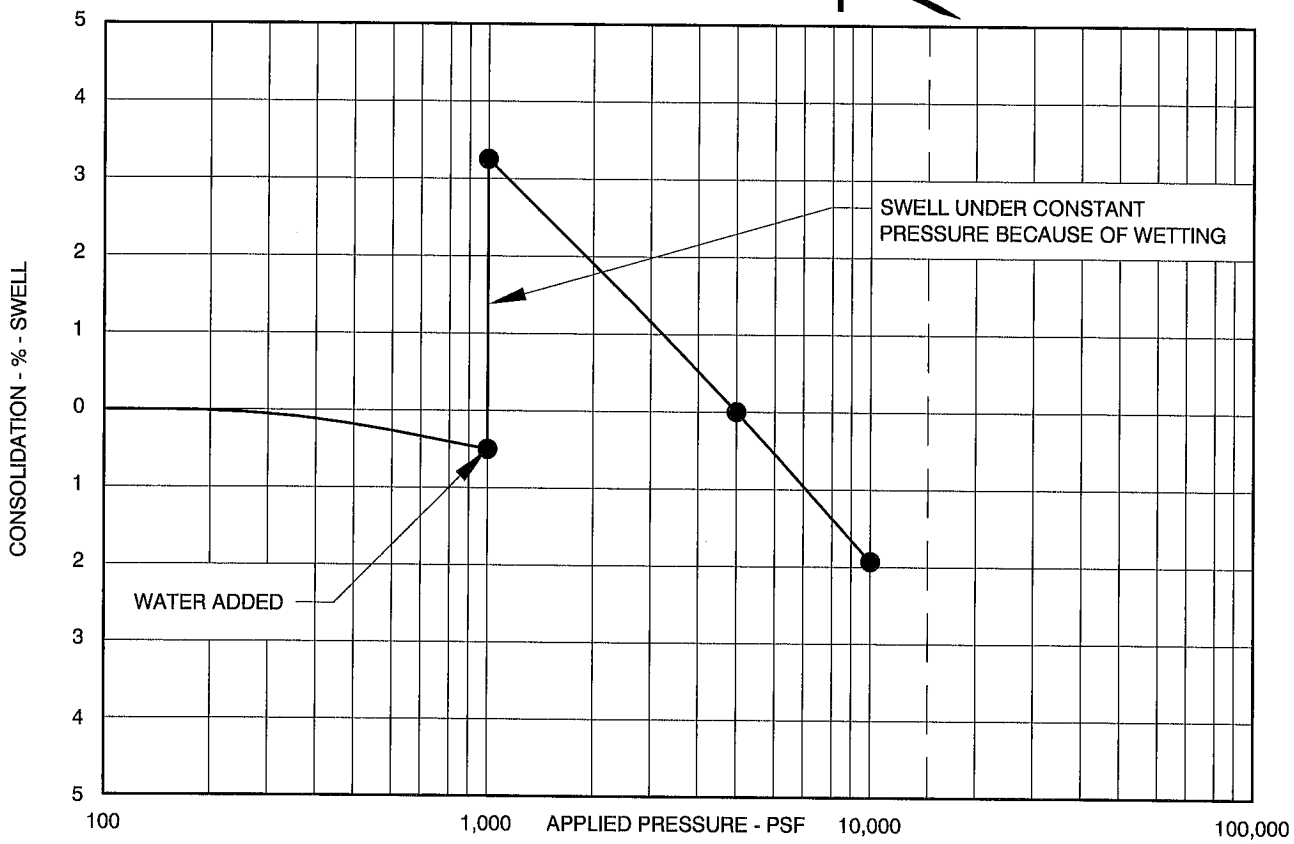
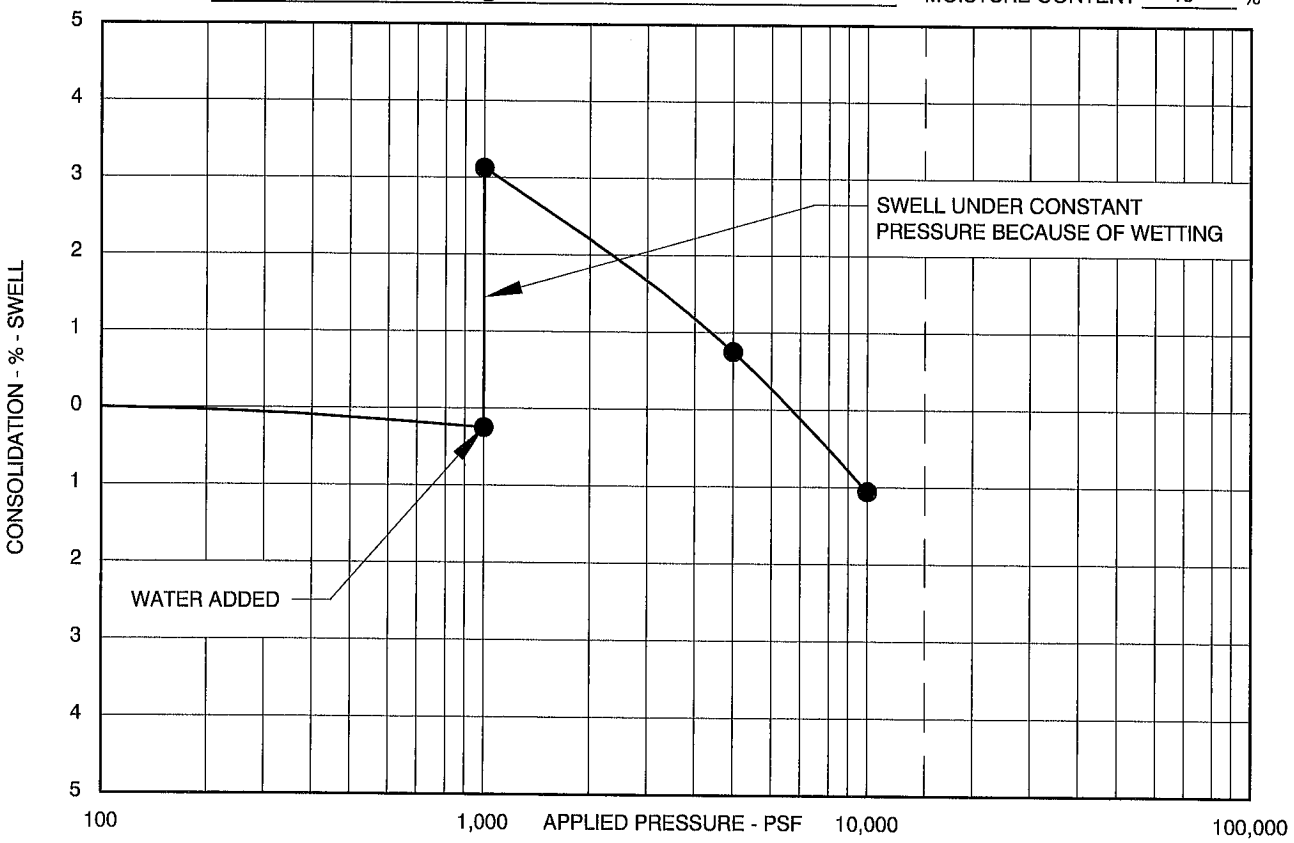


SAMPLE DESCRIPTION CLAYSTONE, SILTY
LOCATION TEST BORING NO. 7 @ DEPTH OF 7'

DRY UNIT WT. 110 PCF
MOISTURE CONTENT 19 %



SAMPLE DESCRIPTION CLAYSTONE, SILTY
LOCATION TEST BORING NO. 7 @ DEPTH OF 34'

DRY UNIT WT. 108 PCF
MOISTURE CONTENT 19 %

SWELL - CONSOLIDATION TEST RESULTS

FIGURE 10

PROJECT NO. 132658

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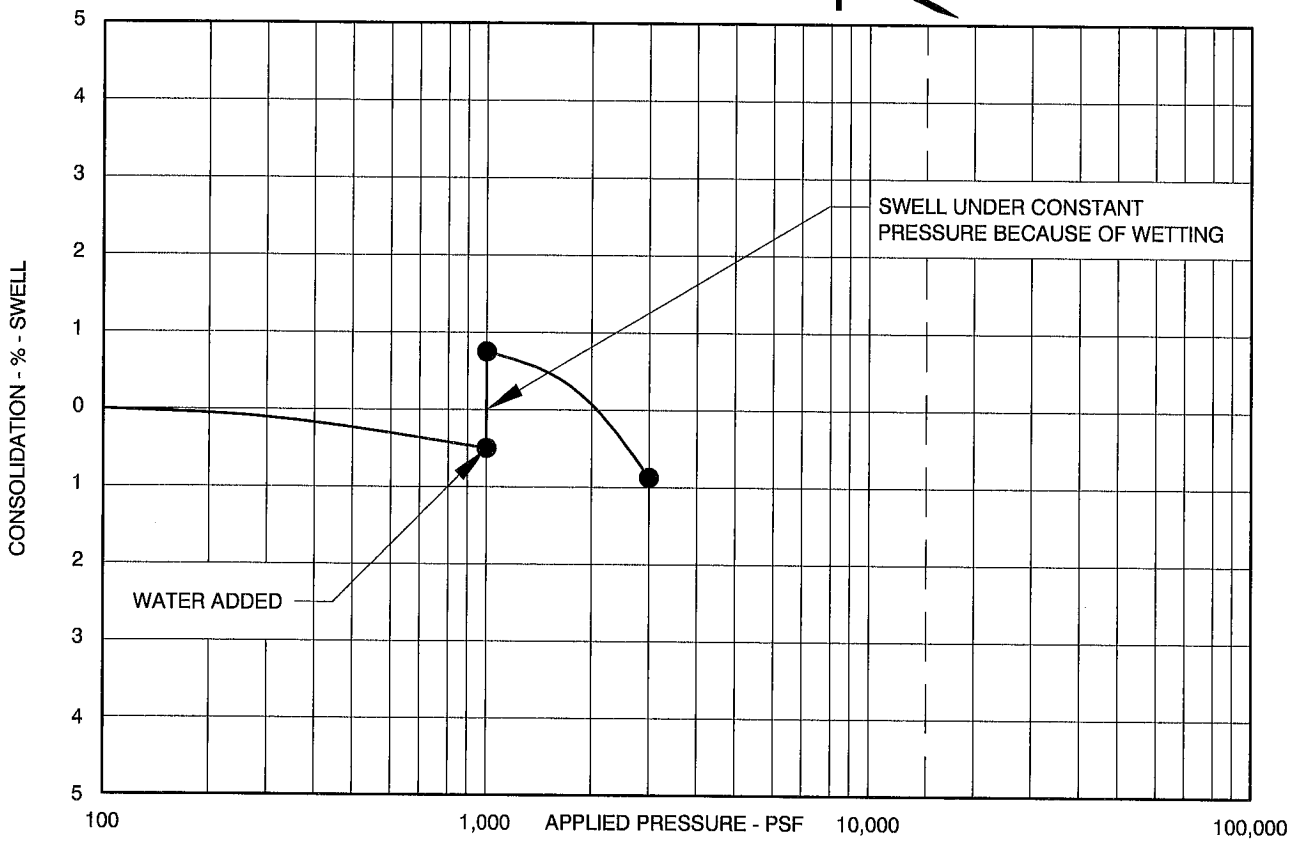
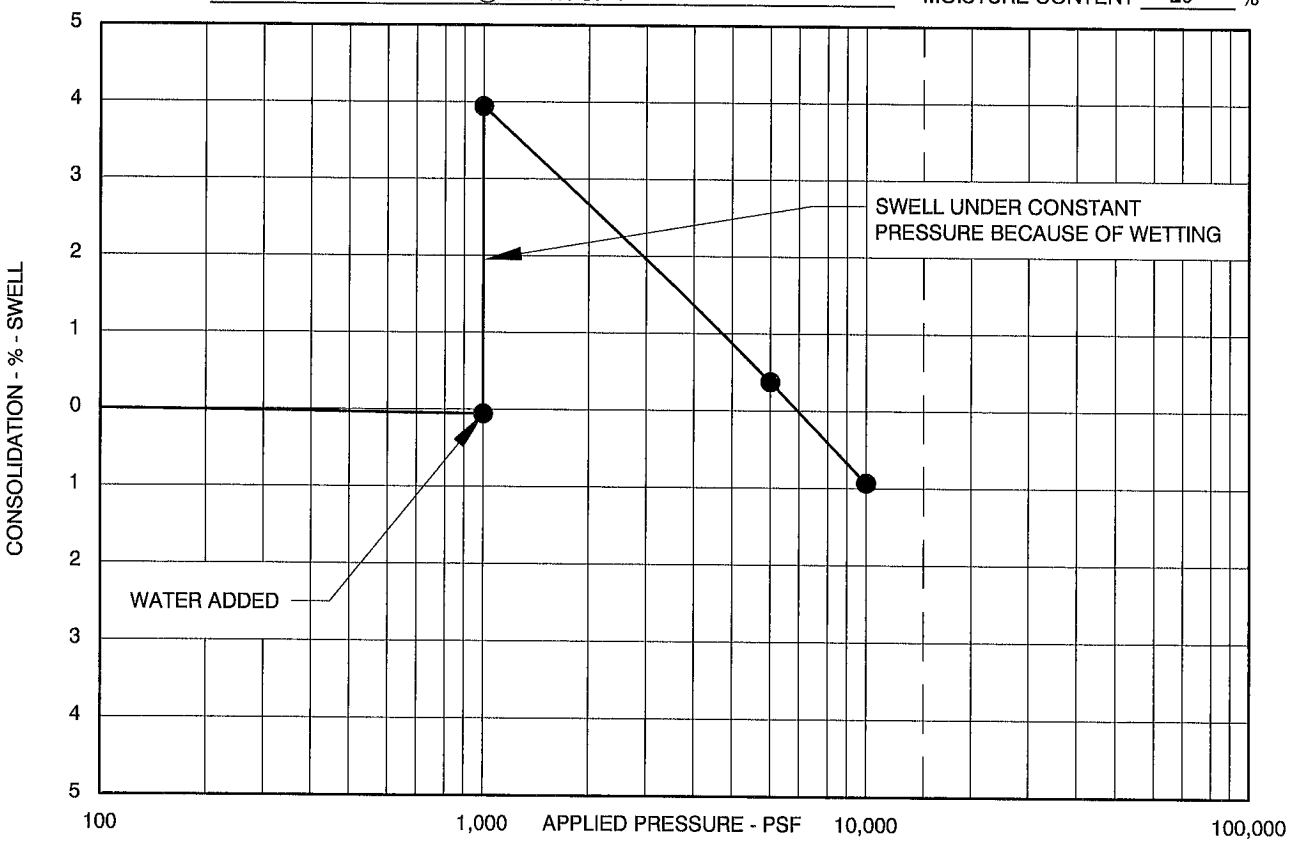


SAMPLE DESCRIPTION FILL, CLAY, SANDY
LOCATION TEST BORING NO. 8 @ DEPTH OF 4'

DRY UNIT WT. 105 PCF
MOISTURE CONTENT 20 %



SAMPLE DESCRIPTION CLAYSTONE, SILTY
LOCATION TEST BORING NO. 8 @ DEPTH OF 19'

DRY UNIT WT. 116 PCF
MOISTURE CONTENT 16 %

SWELL - CONSOLIDATION TEST RESULTS

FIGURE 11

PROJECT NO. 132658

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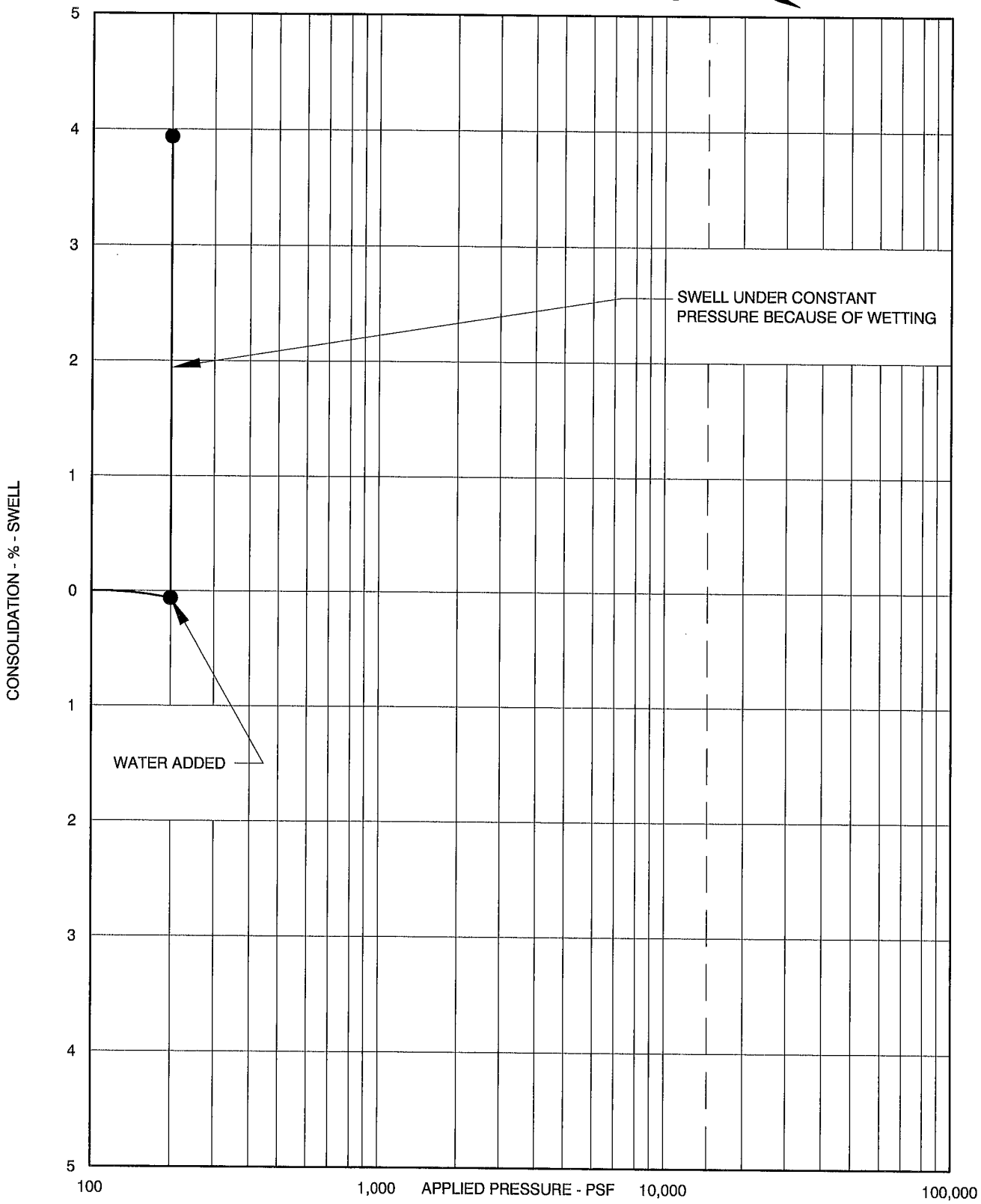

SAMPLE DESCRIPTION FILL, SAND, VERY SILTY

LOCATION TEST BORING NO. 9 @ DEPTH OF 1'

DRY UNIT WT. 116 PCF

MOISTURE CONTENT 7 %

SWELL - CONSOLIDATION TEST RESULTS

FIGURE 12

PROJECT NO. 132658

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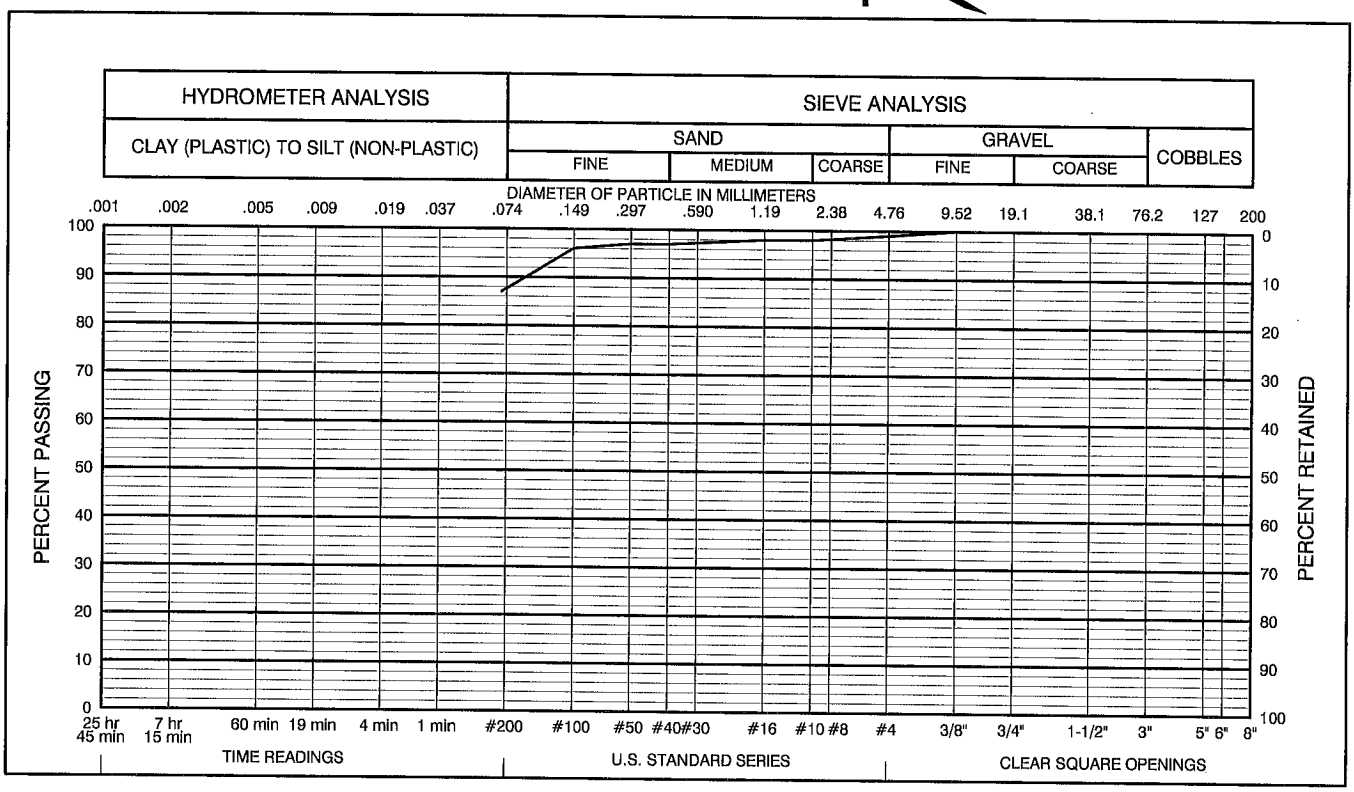
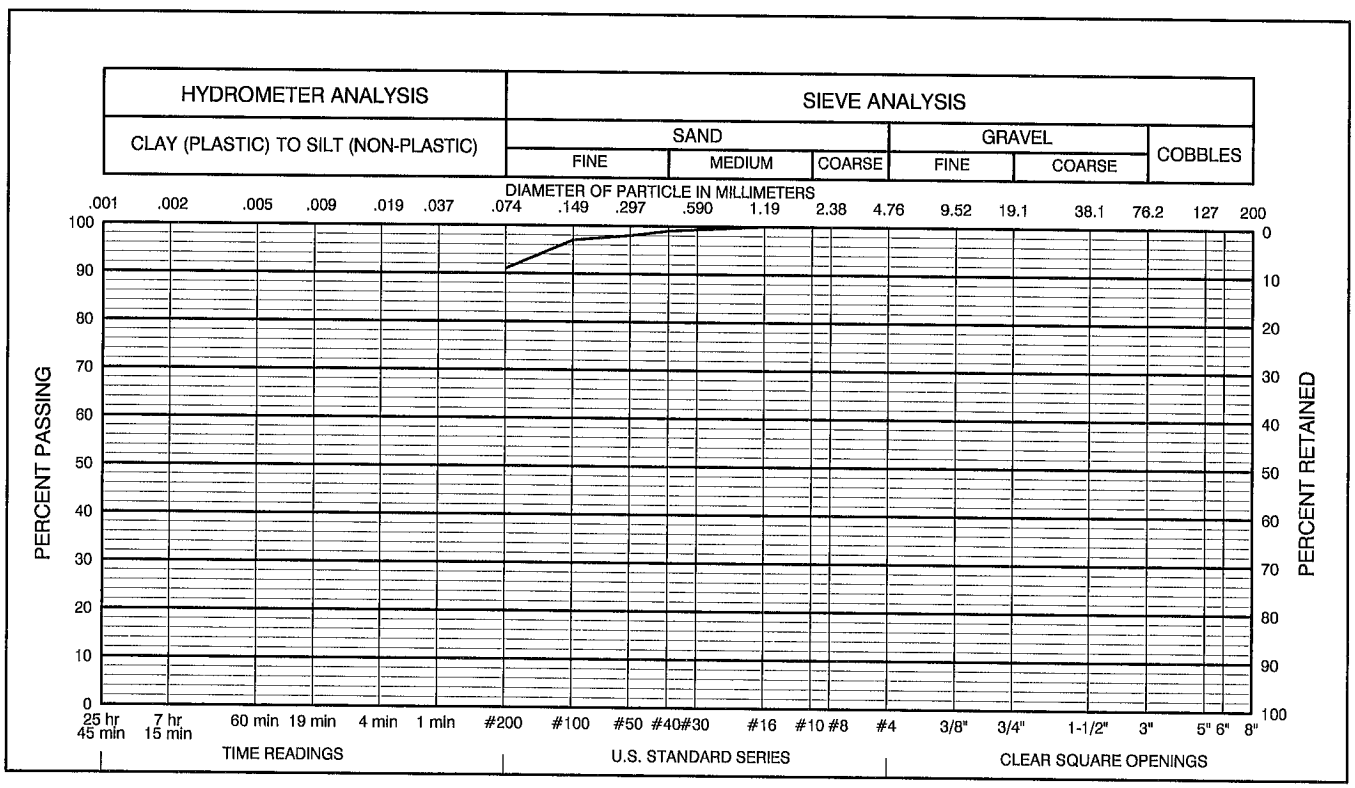


LOCATION TEST BORING NO. 1 @ DEPTH OF 4'
SAMPLE DESCRIPTION CLAYSTONE, SLIGHTLY SANDY (CL)
CLASSIFICATION AASHTO A-7-6 (21)

GRAVEL 1 %
SAND 12 %
SILT & CLAY 87 %

LIQUID LIMIT 42
PLASTICITY INDEX 24



LOCATION TEST BORING NO. 3 @ DEPTH OF 9'
SAMPLE DESCRIPTION CLAYSTONE, SLIGHTLY SANDY (CL)
CLASSIFICATION AASHTO A-6 (17)

GRAVEL 0 %
SAND 9 %
SILT & CLAY 91 %

LIQUID LIMIT 35
PLASTICITY INDEX 19

GRADATION TEST RESULTS

FIGURE 13

PROJECT NO. 132658

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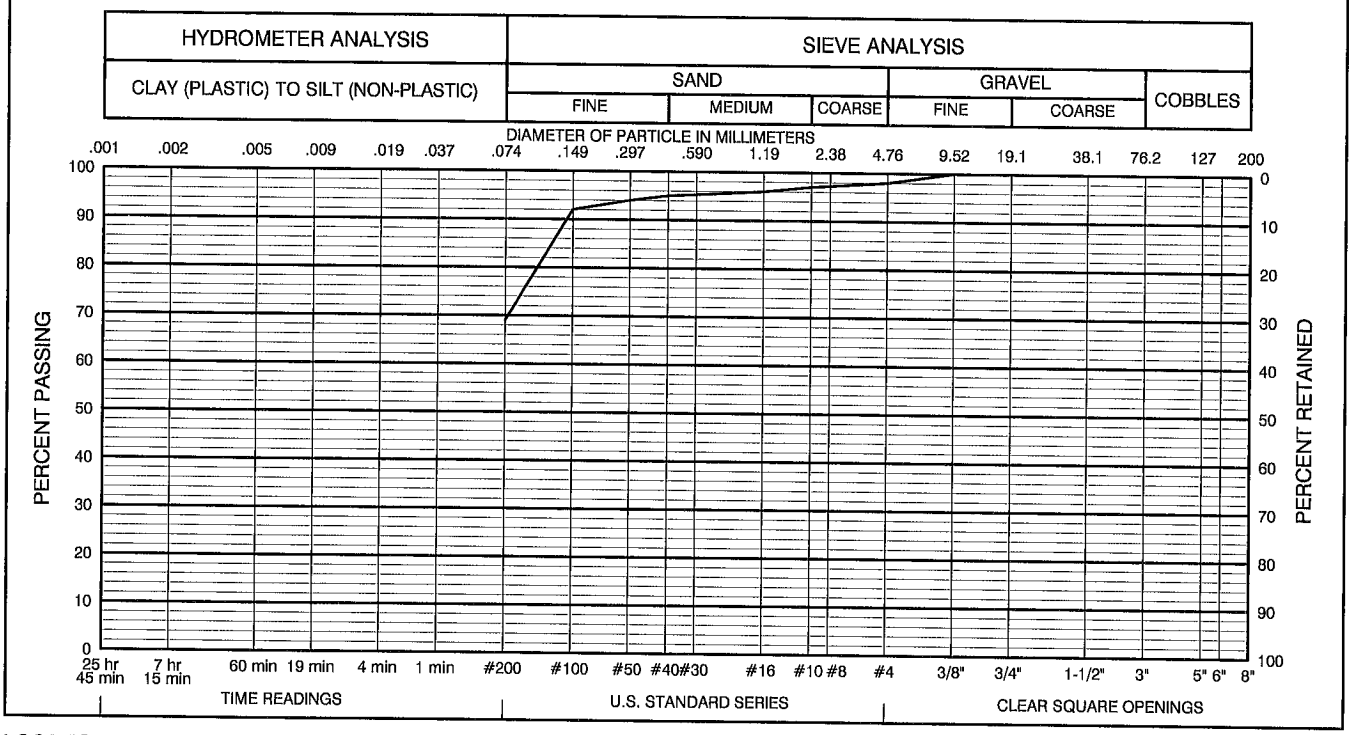
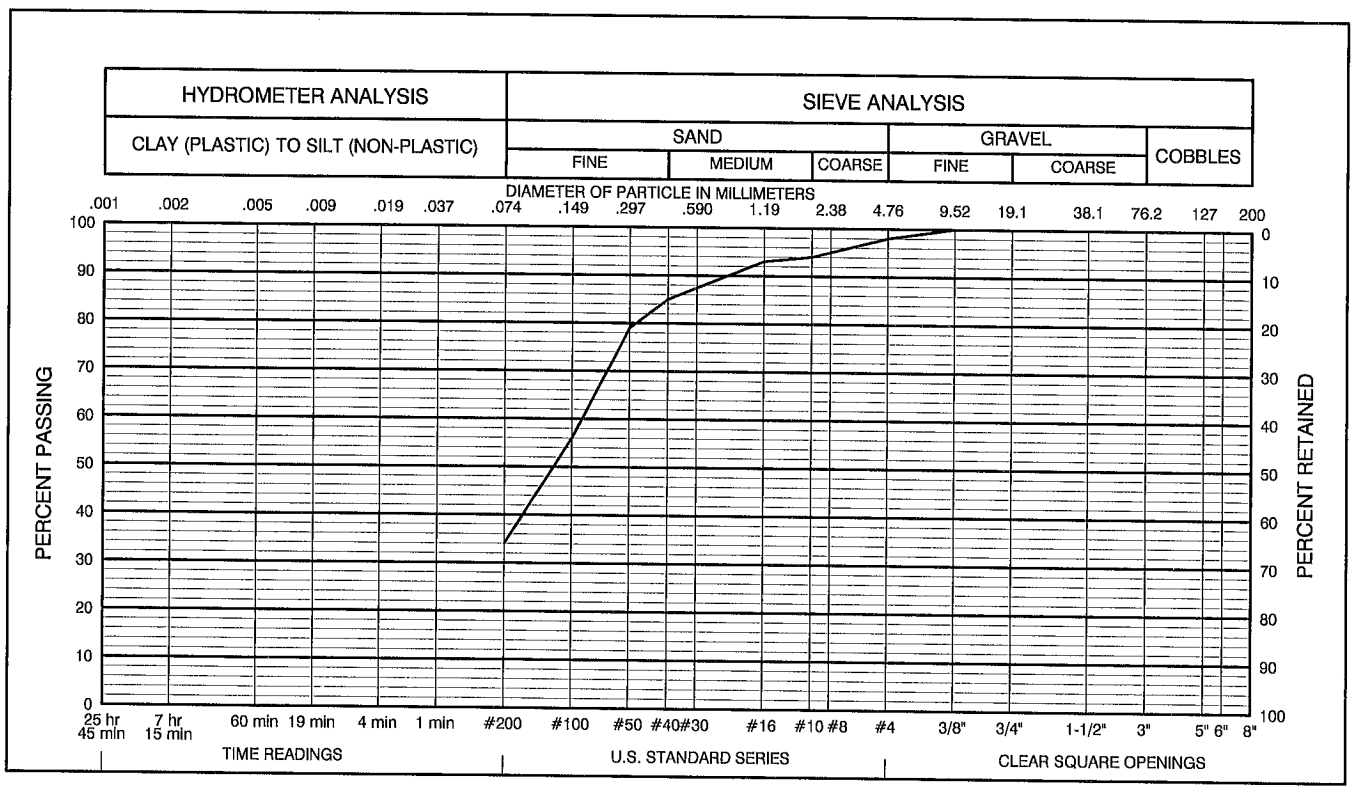


LOCATION TEST BORING NO. 5 @ DEPTH OF 14'
SAMPLE DESCRIPTION CLAYSTONE, SANDY (CL)
CLASSIFICATION AASHTO A-6 (5)

GRAVEL 2 %
SAND 29 %
SILT & CLAY 69 %

LIQUID LIMIT 26
PLASTICITY INDEX 11



LOCATION TEST BORING NO. 9 @ DEPTH OF 1'
SAMPLE DESCRIPTION FILL, SAND, VERY SILTY (SM)
CLASSIFICATION AASHTO A-2-4 (0)

GRAVEL 2 %
SAND 64 %
SILT & CLAY 34 %

LIQUID LIMIT NV
PLASTICITY INDEX NP

GRADATION TEST RESULTS

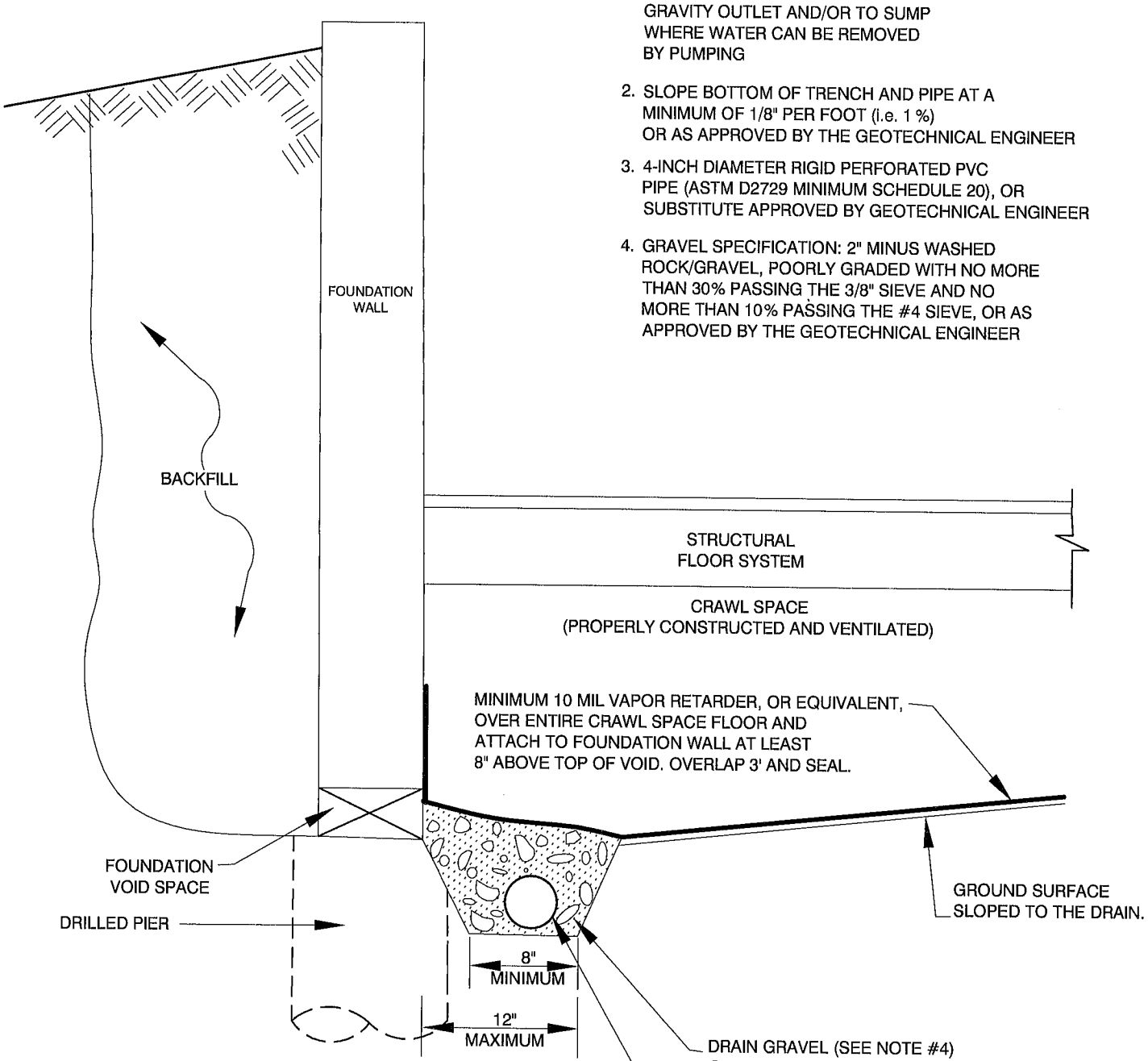
FIGURE 14

PROJECT NO. 132658

A.G. Wassenaar Inc.
Geotechnical and Environmental Consultants

NOTES:

1. DRAIN MUST SLOPE TO A POSITIVE GRAVITY OUTLET AND/OR TO SUMP WHERE WATER CAN BE REMOVED BY PUMPING
2. SLOPE BOTTOM OF TRENCH AND PIPE AT A MINIMUM OF 1/8" PER FOOT (i.e. 1 %) OR AS APPROVED BY THE GEOTECHNICAL ENGINEER
3. 4-INCH DIAMETER RIGID PERFORATED PVC PIPE (ASTM D2729 MINIMUM SCHEDULE 20), OR SUBSTITUTE APPROVED BY GEOTECHNICAL ENGINEER
4. GRAVEL SPECIFICATION: 2" MINUS WASHED ROCK/GRAVEL, POORLY GRADED WITH NO MORE THAN 30% PASSING THE 3/8" SIEVE AND NO MORE THAN 10% PASSING THE #4 SIEVE, OR AS APPROVED BY THE GEOTECHNICAL ENGINEER



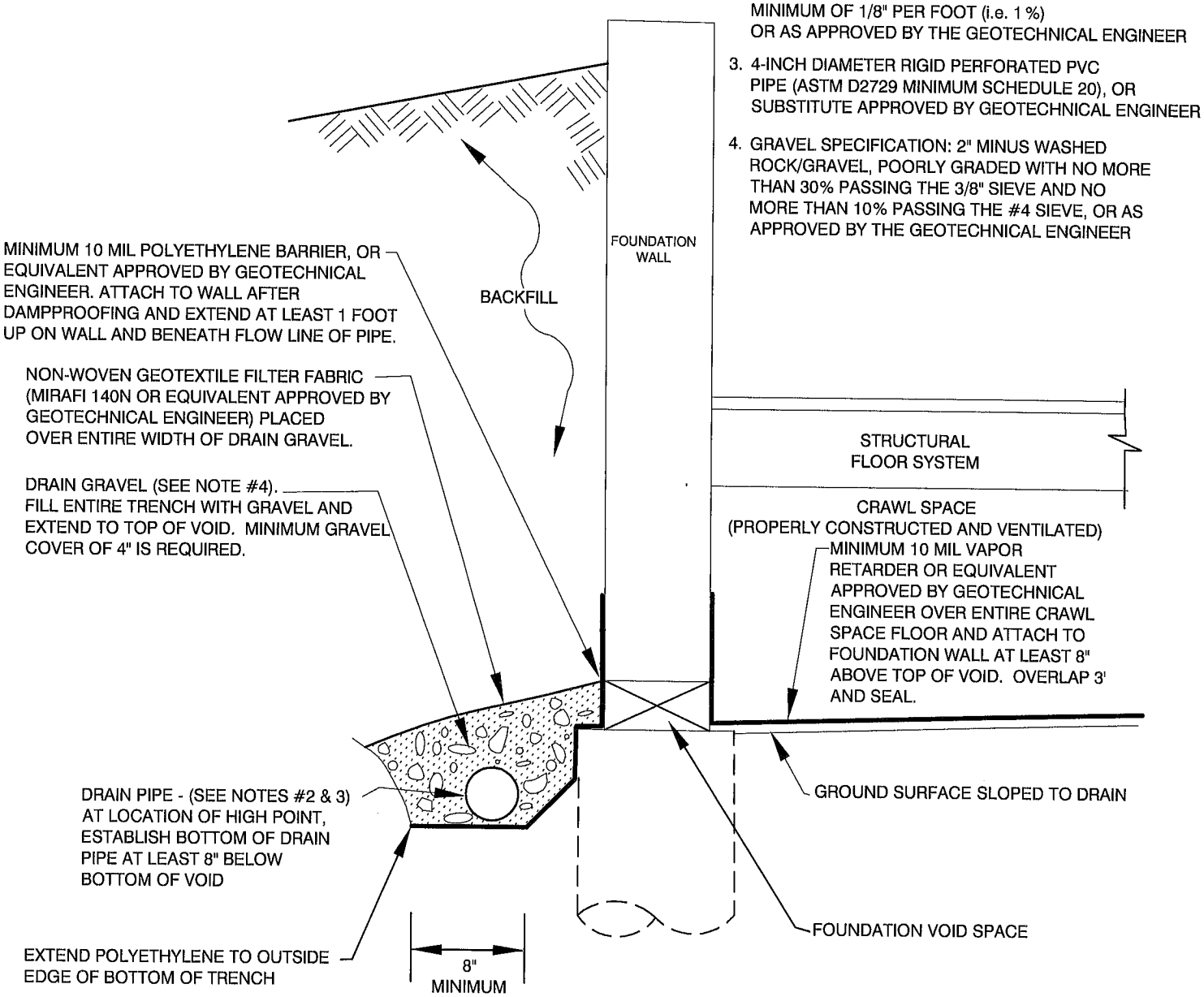
PIER-2 INT SF
SEPTEMBER 2007

PIER FOUNDATION
TYPICAL INTERIOR DRAIN DETAIL
FIGURE 15

PROJECT NO. 132658

NOTES:

1. DRAIN MUST SLOPE TO A POSITIVE GRAVITY OUTLET AND/OR TO SUMP WHERE WATER CAN BE REMOVED BY PUMPING
2. SLOPE BOTTOM OF TRENCH AND PIPE AT A MINIMUM OF 1/8" PER FOOT (i.e. 1 %) OR AS APPROVED BY THE GEOTECHNICAL ENGINEER
3. 4-INCH DIAMETER RIGID PERFORATED PVC PIPE (ASTM D2729 MINIMUM SCHEDULE 20), OR SUBSTITUTE APPROVED BY GEOTECHNICAL ENGINEER
4. GRAVEL SPECIFICATION: 2" MINUS WASHED ROCK/GRAVEL, POORLY GRADED WITH NO MORE THAN 30% PASSING THE 3/8" SIEVE AND NO MORE THAN 10% PASSING THE #4 SIEVE, OR AS APPROVED BY THE GEOTECHNICAL ENGINEER



PIER 4 EXT-SF
SEPTEMBER 2007

PIER FOUNDATION
TYPICAL EXTERIOR DRAIN DETAIL
STRUCTURAL FLOOR
FIGURE 16

PROJECT NO. 132658

Test Boring No.	Depth (feet)	Soil Type	Natural Dry Density (pcf)	Natural Moisture (%)	Swell (+) / Consolidation (−) (%) [1]	Swell Pressure (psf)	% Passing #200 Sieve	Atterberg		Water Soluble Sulfates (ppm)
								Liquid Limit LL	Plasticity Index PI	
1	4	Claystone, slightly sandy	120	14	+0.3	2,200	87	42	24	
	19	Claystone, silty	109	22	+3.6	5,500				
2	2	Fill, clay, sandy	117	10	+0.1	1,700				
	34	Claystone, silty	120	14	+3.7	12,800				
3	9	Claystone, slightly sandy		13			91	35	19	
	14	Claystone, silty	123	13	+4.2	8,200				
	24	Claystone, silty	111	20	+5.6	7,700				
4	4	Fill, clay, sandy	127	10	+2.3	8,200				
	9	Claystone, silty	131	11	+1.6	6,000				
5	14	Claystone, sandy	119	12	+0.3	2,000	69	26	11	
	34	Claystone, silty	92	28	+1.2	4,600				
6	9	Claystone, silty	121	12	+4.4	8,600				
	24	Sandstone, clayey	115	11	+0.8	2,800				
7	7	Claystone, silty	110	19	+3.8	6,000				< 100
	34	Claystone, silty	108	19	+3.5	7,300				

Notes:

[1] Indicates Percent Swell (+) or Consolidation (−) when wetted under a 1,000 psf load, unless otherwise noted.

[2] Indicates Percent Swell (+) or Consolidation (−) when wetted under a 200 psf load.

NV = No Value

NP = Non-Plastic

A.G. Wassenaar Inc.
Geotechnical and Environmental Consultants

SUMMARY OF LABORATORY TEST RESULTS

Vision Land Consultants, Inc.
Multifamily Residential Structures
Project Number 132658

TABLE I

Test Boring No.	Depth (feet)	Soil Type	Natural Dry Density (pcf)	Natural Moisture (%)	Swell (+) / Consolidation (−) (%) [1]	Swell Pressure (psf)	% Passing #200 Sieve	Atterberg		Water Soluble Sulfates (ppm)
								Liquid Limit LL	Plasticity Index PI	
8	4	Fill, clay, sandy	105	20	+1.2	2,700				
	19	Claystone, silty	116	16	+4.0	7,300				
9	1	Fill, sand, very silty	116	7	+4.0 [2]	—	34	NV	NP	

Notes:

[1] Indicates Percent Swell (+) or Consolidation (−) when wetted under a 1,000 psf load, unless otherwise noted.

[2] Indicates Percent Swell (+) or Consolidation (−) when wetted under a 200 psf load.

NV = No Value

NP = Non-Plastic

A.G. Wassenaar Inc.
Geotechnical and Environmental Consultants

SUMMARY OF LABORATORY TEST RESULTS

Vision Land Consultants, Inc.
Multifamily Residential Structures
Project Number 132658

TABLE I

A.G. Wassenaar, Inc.
Geotechnical and Environmental Consultants
2180 South Ivanhoe Street, Suite 5
Denver, Colorado 80222-5710
303-759-8100 Fax 303-756-2920
www.agwassenaar.com

APPENDIX

SPECIFICATIONS FOR PLACEMENT OF STRUCTURAL FILL

GENERAL

The Geotechnical Engineer, as the Owner's representative, shall observe fill placement and conduct tests to determine if the material, method of placement, and compaction are in reasonable compliance with the specifications. Specifications presented in this Appendix are general in nature. They should be used except where specifically superceded by those presented in the attendant Geotechnical Study.

For the purpose of this specification, structural areas include those areas that will support constructed appurtenances (e.g., foundations, slabs, flatwork, pavements, etc.) and fill embankments or slopes that support significant fills or constructed appurtenances. Structural areas will be as defined by the Geotechnical Engineer.

FILL MATERIAL

Fill material shall consist of on or off-site soils which are relatively free of vegetable matter and rubble. Off-site materials shall be evaluated by the Soil Engineer prior to importation. No organic, frozen, perishable, or other unsuitable material shall be placed in the fill. For the purpose of this specification, cohesive soil shall be defined as a mixture of clay, sand, and silt with more than 35% passing a U. S. Standard #200 sieve and a Plasticity Index of at least 11. These materials will classify as an A-6 or A-7 by the AASHTO Classification system. Granular soils shall be all materials which do not classify as cohesive.

PREPARATION OF NATURAL GROUND

Vegetation, organic topsoil, any existing fill and any other deleterious materials shall be removed from the fill area. The area to be filled shall then be scarified, moistened if necessary, and compacted in the manner specified below prior to placement of subsequent layers of fill.

PLACEMENT OF FILL MATERIAL

The materials shall be delivered to the fill in a manner which will permit a well and uniformly compacted fill. Before compacting, the fill material shall be properly mixed and spread in approximately horizontal layers not greater than 8 inches in loose thickness.

MOISTURE CONTROL

While being compacted, the material shall contain uniformly distributed moisture for compaction. The Contractor shall be required to add moisture to the materials if, in the opinion of the Geotechnical Engineer, proper and uniform moisture is not being obtained for compaction. If the fill materials are too wet for proper compaction, aerating and/or mixing with drier materials may be required.

Moisture content shall be controlled as a percentage deviation from optimum. Optimum moisture content is defined as the moisture content corresponding to the maximum density of a laboratory compacted sample performed according to ASTM D 698 for cohesive soils or ASTM D 1557 for granular soils. The moisture content specifications for the various areas are as follows:

	Cohesive Soils	Granular Soils
1. Beneath Structural Areas:	-1 to +3%	-2 to +2%
2. Beneath Non-Structural Areas:	-3 to +3%	-3 to +3%

COMPACTION

When the moisture content and conditions of each layer spread are satisfactory, it shall then be compacted by an approved method. Moisture-density tests shall be performed on typical fill materials to determine the maximum density. Field density tests must then be made to determine the adequacy of the fill compaction. The compaction standard to be utilized in determining the maximum density is ASTM D 698 for cohesive soils or ASTM D 1557 for granular soils. The following compaction specifications should be followed for each area:

1. Beneath Structural Areas: 95% of Maximum Dry Density
2. Beneath Non-Structural Areas: 90% of Maximum Dry Density

Note: In areas where fill depths exceed 20 feet, additional compaction considerations will be required to reduce fill settlement. We recommend any fill placed within 20 feet of final subgrade elevation be compacted as required above, and that deeper fills be compacted to 100% of maximum dry density at a moisture content of ±2 percent of optimum moisture content.

If the structural fill contains less than 10 percent passing the No. 200 sieve, it may be necessary to control compaction based on relative density (ASTM D 2049). If this is the case, then compaction around the structures and beneath slabs shall be to at least 70% relative density, and compaction beneath foundations and pavements shall be to at least 80% relative density.