WESTBERG + WHITE, INC.
ARCHITECTS AND PLANNERS

January 20, 2014

County of Santa Barbara
Capital Projects division
1105 Santa Barbara Street
Santa Barbara, Ca 93101

Attention: Mr. Andrew Tranovich

Subject: **ADDENDUM to Pre-Design Assessment Report**
For the New Cuyama Pool Incident Reconstruction Project
290 Wasioja Street, New Cuyama, Ca 93254
County of SB – P.O. #CN15986
County of SB Project No. 8736 NCPI
W+W Project No. 13032

Dear Mr. Tranovich,

This ADDENDUM to the Pre-Design Assessment Report dated November 13, 2013, is provided to summarize the impacts of additional review comments, site observations, reports and findings that have occurred since the original W+W and SSG report was issued. As a result of these new factors, our assessment comments and repair recommendations have changed and are presented below for the County's consideration.

Following issuance of the original W+W and SSG report, the report was reviewed by project participants and W+W consultants, notably including County representatives, Fugro Consultants Inc. (geotechnical), Rowley International Inc. (Aquatic Design), Penfield & Smith (Civil). As a result of consultations among these participants and as recommended in the report, Fugro Consultants Inc was engaged to perform a monometer survey and Rowley International Inc. was engaged to perform a site visit to assess the condition of the large pool and the feasibility of repairing it in place rather than replacing it.

The results of the manometer survey are pending at this time. However, Don Hertel facilitated and attended the subsequent site visit by William N. Rowley, Ph.D., P.E. and Greg Cannon of Rowley International on December 18, 2013. A report entitled "Joseph Centeno Cuyama Pool & Aquatics Complex Assessment", dated January 3, 2014, was prepared by William N. Rowley and issued to the participants. The Rowley report is made a part of this ADDENDUM by reference.

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As result of The Rowley International report findings, our own additional investigations and our consultations with project participants, we hereby modify our Pre-Design Assessment Report as follows:

With respect to the primary cause of the main collapse event, we continue to support the Fugro determination of the sequence of events which establishes that leakage of the deck and deck drainage systems led to settlement of sub-soils which led to ruptured pressure piping and subsoil wash-out. We also support the findings of the Rowley Report which recommends replacement of the large pool and provides additional insights and details. In our view, defects in the detailing and construction of the deck and deck drainage led to leakage and were the primary cause in this area.

The presence of native hydro-collapsible soils underlying the relatively shallow existing compacted earthen pad, and the likely presence of some residual collapse potential within compacted utility trench fill and within the conventionally compacted earthen pad, both of which re-utilized hydro-collapsible on-site soils, most likely exacerbated the degree and extent of the main collapse event and also extended the limits of damage due to moisture intrusion based settlement to include areas north and west of the masonry building. In our view, this secondary aspect of the damage derives from underlying native site conditions and related omissions in the original soils report with regard to their mitigation.

Therefore, in our judgment, all of the following recommended reconstruction work is directly related either to the primary or secondary causes of the collapse event and is required in order to restore the damaged facilities.

ASSESSMENT COMMENTS AND REPAIR RECOMMENDATIONS

Prior to completion of design details and initiation of the Construction Document Phase of the work, we recommend completion of the following services:

1. Review of the results of the manometer survey recently performed by Fugro Consultants. This will help assess the degree of differential settlement that has occurred at the masonry building and help determine the best approach to stabilization of its foundation.

2. Preparation of a reconstruction soils report by Fugro Consultants that would provide the necessary geotechnical engineering design parameters for determination of the depth and extent of the over-excavation and reconstruction of the pool and deck area foundation pads, for the design of excavation boundary conditions with respect to existing construction to remain and for use by the architect, pool consultant and structural engineer in the design of reconstruction details. Their scope of work should also include review of the 50% construction documents and construction phase site observations to assure consistency with the report's recommendations as the geotechnical engineer of record for the reconstruction work. To support their construction phase work, the County would also retain a testing lab for construction phase testing in accordance with the construction documents.

3. Preparation of a topographic survey by Penfield & Smith to provide data for preparation of new excavation and grading plans and to establish datum points for tie-in of the manometer survey data.

Following is an outline of our recommended scope of reconstruction work, presented for consideration by the County. Design and preparation of construction documents for execution of the work will be provided by the WW led reconstruction design team. Per the general scope of work established by the County, the original design will be restored, except where improved details are required to correct design deficiencies, where infeasible, where codes require changes, or where minor deviations are warranted and approved by the County.

Recommended repairs directly related to primary or secondary causes of the soil collapse event:

1. Demolition and Site Preparation:

    a. Demolish and remove all damaged existing construction including: the large pool, the wading pool, the concrete decking, fencing, perimeter sidewalks, underground piping and storm drainage systems, electrical conduit, lighting, shade structures, pool equipment, etc., as required to completely reconstruct the damaged pools, deck areas and surrounding paving and the earthen foundation pad.
    b. Remove impacted adjoining area improvements such as a portion of the pool complex parking lot as may be required to remove the existing foundation pad (originally called out as 4 feet below existing grade or 2 feet below footings), over-excavate and replace it with a deeper foundation pad (on the order of 10 to 15 feet below the original grade) of non-collapsible soil in conformance to the new reconstruction soils report to be prepared by Fugro Consultants Inc.
    c. Over-excavate the exposed sub-surface soils under the observation and direction of the soils engineer until competent material is reached at the recommended depth. Scarify and re-compact the exposed material per the reconstruction soils report. Avoid undermining of adjacent structures. Contractor shall provide shoring, designed by a licensed professional engineer, if needed.
    d. Provide provisions for the protection of the existing structures and improvements to remain. Salvage for reuse serviceable existing structures such as the shade structures. Remove and salvage all other reusable existing improvements and equipment interfering with reconstruction and store for re-installation.
    e. Remove clear, grub and remove all existing landscape, hardscape and irrigation piping outside of the existing pool at fence line along the northerly and easterly perimeter of the facility and on the masonry building's westerly side to permit required foundation pad reconstruction and repair and prepare for installation of new irrigation-free landscape/hardscape.
    f. Saw-cut and remove a portion or portions of the existing damaged concrete floor slabs within the Men's and Women's restrooms and Equipment Room, including the existing floor drain(s) and drain piping in

order to access the sub-grade for foundation repairs and to repair the sub-grade and floor slab.

2. Earthwork and Underground Utilities Reconstruction:

    a. The WW reconstruction team, including Rowley International, Inc., shall establish test methods and criteria to examine and test all existing utilities to remain for serviceability and damage. Replace all damaged underground utility lines and conduit to code and industry standards, rough-in for new reconnections and accessories.
    b. Reconstruction of all underground utilities shall incorporate utility trenches with impervious liners to contain leaks and with sub-drainage piping to remove leak water should leaks occur.
    c. Depending upon manometer results and recommendations of the new reconstruction soils report, install new masonry building grade beam and underpinning and/or pressure grouting, for leveling and sub-grade stabilization. The method to be used shall be developed in consultation among the participants, including Fugro, SSG, WW and the County.
    d. Over-excavate and reconstruct a new deeper foundation pad with non-collapsible soil and sub-drainage provisions in accordance with the new reconstruction soils report to be issued.
    e. Construct a sump pump basin for pump-out of sub-drain water as recommended by the team's civil engineer, Penfield & Smith.

3. Large Pool Reconstruction:

    a. Reconstruct the large pool in its entirety, with sub-drainage, generally following the original design, but incorporating any needed design improvements required by code or recommended by Rowley International Inc. as a result of the prior collapse event.

4. Wading Pool Reconstruction:

    a. Reconstruct the wading pool in its entirety, with sub-drainage, generally following the original design, but incorporating any needed design improvements required by code or recommended by Rowley International Inc. as a result of the prior collapse event.

5. Deck Reconstruction

    b. Reconstruct the existing concrete deck areas and deck drainage in their entirety, including their sub-drainage systems, with separation from the sub-grade by an impervious membrane as referenced below, generally following the original design, but incorporating any needed design improvements required by code or recommended by W+W, Rowley International Inc., Rowley International Inc and the design team as a result of the prior collapse event.
    c. Overlay the new concrete deck base sub-grade, and cover below all slot drain and cleanout box excavations with a waterproof under slab barrier such as the WR Meadows PMPC underslab system (see Fig.2) having all penetrations sealed. The waterproof barrier shall be turned up at the

sides of the wading pool, large pool and at existing building footings and sealed per manufacturer's recommendations to form an impervious layer below the new deck areas. Install water stops where required to prevent water intrusion into the sub-grade.

d. Install concrete deck perimeter trench drains, such as the factory manufactured HDPE type shown in Fig.6 of the Pre-design Assessment Report, with stainless steel grates, sealed joints, at the new deck edges. Run the drainage lines to a new sump pump (see example at Fig.7 of the Pre-design Assessment Report) with discharge to the sanitary sewer – to be designed by the WW team Civil Engineer, Penfield & Smith.
e. Install new cleanout and drainage inlet boxes using manufactured HDPE types such as the Zurn products shown in Figs. 4 and 5 of the Pre-design Assessment Report, with stainless steel grates, sealed joints, and connect to the new storm drain piping.
f. Install new deck area field fabricated slot drains with new water tight manufactured HDPE types, such as the Zurn product shown in Fig.3 of the Pre-design Assessment Report, with stainless steel grates, sealed joints, and connect to the new cleanout and drainage inlet boxes.
g. Reconstruct the concrete deck areas in general conformance with the original plans except where improvements are needed as a result of the prior collapse event, such as in drainage patterns, at new slot drains, cleanout boxes and perimeter edge trench drains and where other alternative drainage slopes or details may be shown in the final plans as a result of design team collaboration and County approval.
h. Install new expansion joints and control joint sealant at all expansion joints and control joints.

6. Masonry Building Repairs:

   a. Inspect, test and repair all masonry building piping, fittings and equipment in the areas affected by the event and/or included in the area of work, including the restrooms and the pool equipment room equipment and repair or replace as needed.
   b. Patch and repair all cracks by epoxy injection or other appropriate means.
   c. Clean, restore and/or reconstruct all damaged building finish surfaces, hardware accessories and fittings in the area of work per the original plans, including the repair of copings, tile work graphics, plaster finish lining, inlets and drains, etc.

7. Non-irrigated Landscape / Hardscape, Fencing and Paving Repairs:

   a. Replace existing concrete or asphalt paving, fencing, landscaping and other improvements at perimeter site areas directly damaged or affected by new code requirements or by the requirements of the reconstruction work.
   b. At previously landscaped and irrigated areas, provide non-irrigated landscaping with relatively impervious surfacing, or D.G. surfacing, as preferred by the County, including a moisture resistant membrane underlayment and sub-drainage where required to direct water away from the existing building, earthen pad, new decks and pool areas.
   c. Install new replacement fencing and gates.

d. Install new concrete and asphalt paving where removed due to event damage or as a result of reconstruction impacts.

8. In connection with the reconstruction, perform a code review to identify any existing non-compliant features that should be addressed as part of the reconstruction which will be governed by the new 2013 CBC and the current versions of other applicable codes.

COMMENTS AND CONCLUSIONS

Pre-Design Cost Estimate

A revised preliminary Pre-Design Cost Estimate is attached for budgeting purposes. This will be updated at the 50% CD phase to include adjustments resulting from development of the details of the reconstruction design with input from all WW team members, the County and the County's other consultants. The County has assumed responsibility for establishing the "Soft Costs" budget and these amounts will be adjusted following identification of fees for services for remaining phases of the work.

Pre-Design Schedule

A revised preliminary Pre-Design Project Schedule is attached for planning purposes. This will be updated at the 50% CD phase to include adjustments resulting from development of the details of the reconstruction design with input from all WW team members, the County and the County's other consultants. It was the County's intent to have the reconstructed facility ready for occupancy by January 1, 2015. However, the increased scope of work related to replacement of the large pool requires that the schedule be extended.

Qualifications and Exclusions

This Report is based upon referenced observations of existing site conditions and review of the cited written documents. There may be hidden or latent conditions or deficiencies in existing improvements to remain by others or resulting from changes made during the original construction and not documented, that were not apparent to the authors of this report. Additionally, a portion of the existing earthen pad containing compacted hydro-collapsible soils will remain in place below the existing masonry building and underlying native hydro- collapsible soils at depth will remain throughout the site. Therefore no warranty is made that the recommended repairs will preclude the re-occurrence of settlement or collapse events in the future should water intrusion from whatever source occur.

The intent of the Report's recommendations, as directed by the County is to follow the original design except where improvements, needed as a result of the prior collapse event, are recommended by the WW team and approved by the County. In its execution of the remaining phases of the work, the WW team assumes no responsibility for remaining original design components or for any underlying, hidden or latent conditions or for work provided by others.

We appreciate the opportunity of working with the County on this important reconstruction project for the New Cuyama Community. We respectfully submit this ADDENDUM to the Pre-Design Assessment Report dated November 13, 2013, including our revised recommended reconstruction strategies for consideration by the County and other participants. Please contact me if you have any questions or additional information is required.

Sincerely,

Don Hertel, Principal Architect C-15710
Santa Maria, CA Office (805) 346-2991

Enclosures: Pre-Design - Cost Estimate
Pre-Design - Project Schedule

Copy: Celeste Manolas, Co of SB
Todd Morrison, Co of SB
Michael Parolini, SE

PRE- DESIGN – COST ESTIMATE **[ADDENDUM]**
PO CN15986 Jan. 20, 2014 Update

Reconstruction Description	**Estimated Repair Cost**
Site Preparation,Demolition,Earthwork	130,000
Pressure test & repair remaining piping *(allowance.)*	10,000
Remove and replace (E) Large Pool	275,000
Remove and replace (E) Wading Pool	75,000
Remove and replace (E) Pool Decks *(including under slab membrane)*	135,000
Remove, salvage and Reinstall (E) Shade Structures	15,000
Remove and replace Underground piping and Utilities, in deck areas, including: Elec., Pool, Storm, Sewer,Sub-drains, slot-drains, basins	95,000
(E) Masonry Building repairs, including foundation, plumbing, walls and floors	55,000
Fencing, Landscape, paving and misc. site repair work	65,000
Allowance for Code upgrades and construction contingency	45,000
Construction Sub-Total	900,000
Contractor's GC, OH & P (25%)	225,000
Pre-Design Construction Est. Total* :	**$ 1,125,000**

* Not including "Soft Costs", including County Project Management, A/E fees, Permits, Inspections, Testing, Geo Engineer, Special surveys and Pre-D Reviews, Advertising, printing, misc. project Expenses (TBD by County) — TBD

PRE- DESIGN – SCHEDULE **[ADDENDUM]**

PO CN15986 Jan. 20, 2014 Update

MILESTONE	TARGET DATE	NOTES
PSA, PO CN15986 dated Oct/10/2013	**Oct. 10,2013**	
Complete Pre- Design (PD) by:	**Nov. 27, 2013**	
Submit 100% PD Report	Nov. 13	
Completion of County Review	Nov. 27	Recommended Additional Investigations
Complete CD Phase Preparations	**Mar 14, 2014**	Including Rowley site visit & Report
Complete project team formation and submit fee proposal for remaining phases	Dec 3	
Completion of Report ADDENDUM	Jan 20	Submitted on Jan 20 with revised Proposal incl. Pool Removal
Review and Approval by County	Feb 7	
Notice to Proceed (NTP) with CD Phase	Mar 14	
Complete 50% Construction Documents (CD) by:	**May 9, 2014**	6 weeks to 50% submittal
Start of CD Phase after NTP	Mar 14, 2014	
Submit 50% complete CD Package	Apr 25	
Completion of Review / Approval by County	May 9	2 weeks for review
Complete 100% Construction Documents by:	**Sept 5, 2014**	
Submit 100% complete CD Package	June 13	5 weeks to 100% submittal
Receive corrections from plan review	Aug 8	8 week plan review period
Completion of Review / Approval by County	Sept 5	Corrections and final review (4 weeks)
Complete Bidding (Bid & Award) by:	**December 18, 2014**	
Provide Completed bid Package to County by	Sept 10	
County B.O.S. Permission to Bid	Oct 15	
County to complete Bid process	Nov 17	4 – 1/2 week Bid period (no Pre-Qual)
County B.O.S. Contract Award	Dec 15	
Notice to Proceed to Contractor by:	Dec 18	
Completion of Construction by:	**September 18, 2015**	
Mobilization on-site and start of work by:	Jan 5	
Substantial project completion by:	July 20	6-1/2 month construction period
Final Completion and Acceptance by:	Aug 17	4 weeks to Acceptance
Ready for Occupancy by:	**Sept 18, 2015**	4 weeks to Occupancy
11th Month Warranty Inspection (1-year warranty)	**Sept 16, 2016**	

Rowley International Inc

Aquatic Design, Engineering & Consulting

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Joseph Centeno Cuyama Pool & Aquatics Complex Needs Assessment

By William N. Rowley, Ph.D., P.E., President
and Greg Cannon, Managing Principal

Prepared on January 6, 2014 for

DONALD L. HERTEL, RA
PRINCIPAL ARCHITECT

WESTBERG + WHITE, INC.
ARCHITECTS AND PLANNERS
719 South McClelland Street
Santa Maria, California 93454

Joseph Centeno Cuyama Pool
& Aquatics Complex Assessment

Date of Rowley Site Visit: December 18, 2013

Table of Contents

NOTE: Paragraphs in this Needs Assessment are sequentially numbered for clarity and ease of referencing.

I. Materials And Documents Reviewed:

A. Reports

1. Fugro Consultants, Inc. Evaluation of Hydroconsolidation Potential New Cuyama Aquatics Facility, New Cuyama, California April 2013 (Revised May 2013)
2. Westberg + White, Inc. Architects And Planners Pre-Design Assessment Report For the New Cuyama Pool Incident Reconstruction Project 11/13/2013
3. Smith Structural Group, LLP Pre-Design Assessment Structural Investigation & Evaluation Report 11/13/2013

B. Photographs

1. 24 black-and-white photographs in Westberg + White, Inc. 11/13/13 Report
2. 19 Photographs Taken by William N. Rowley during Site Inspection on 12/18/2013
3. 14 Photographs Taken by Greg Cannon during Site Inspection on 12/18/2013

B. Drawings

1. Aquatic Design Group's Cuyama Aquatics Complex Project No 8656 Final 1-5-2010 Revised Drawings: DP-1, SP-1, SP-2, SP-3, SP-4, SP-5, SP-6, SP-7, SP-8, SP-9, SP-10, SP-11, SP-12, SP-13, SP-14, SP-15, SP-16, SP-17, and SP-18
2. Rowley Drawings: 1 Swimming Pool Survey Elevation Drawing, 1 Wading Pool Survey Elevation Drawing.

II. Professional Background

A. I, William N. Rowley, Ph.D., P.E., C.S.P., F.N.A.F.E., F./L.M.A.S.M.E. have been professionally involved in the design of residential and large commercial swimming pools for over forty (40) years.

B. I am a Major General (retired) of the United States Air Force Reserves. At the time of my retirement after thirty-six years of service to the United States of America, my extensive supervisory command consisted of over 75,000 officers and airmen in the United States Air Force Systems Command. As an Air Force officer, I successfully completed four courses of professional military education (listed in order of increasing importance and difficulty): Squadron Officer School, Air Command & Staff College, Industrial College of the Armed Forces (Master's Degree equivalent), and Air War College (Master's Degree equivalent).

C. I am the founder and Chairman of the Board of Rowley International Inc, an aquatic design, engineering, and consulting firm established in 1974. I have directed the design and monitored the construction of over 650 major commercial swimming pools, including over ninety 50-meter swimming pools, throughout the world.

D. I am and have been a Registered Professional Engineer in the State of California continuously since February 15, 1963 (50 years) when I obtained my first and still current Registered Mechanical Engineering license #M12864 (expires 9/30/2015). I am also a Registered Corrosion Engineer in the State of California. My Corrosion Engineering License number is #CR000378 (expires 6/30/2015). I have been a Registered Corrosion Engineer continuously in the State of California since 11/10/1976 (37 years).

E. I am a Board-Certified Diplomate of the International Board of Forensic Engineering Sciences (IBFES). As a Fellow of the National Academy of Forensic Engineers (NAFE), I am a Board-Certified Diplomate in Forensic Engineering. I am also a Fellow and Life Member of the American Society of Mechanical Engineers (ASME).

F. I was licensed on February 3, 1975 as a General Engineering (A) Contractor (#302451) in the State of California and hold the following General and Specialty Contractor's Licenses which are presently not current: Engineering (A), Plumbing (C-36), Swimming Pool (C-53), and Solar (C-46).

G. I am a Certified Safety Professional (CSP #9731) and have been continuously certified by the Board of Certified Safety Professionals (BCSP) since 1990. The CSP certification is the preeminent safety certification for safety professionals in the United States of America and requires education, professional safety experience, and demonstrated knowledge of professional safety practice. CSP applicants undergo an eight-hour safety exam and must be recertified every five years.

H. From the University of Southern California, I received a Bachelor of Engineering degree in Mechanical Engineering in 1955 and a Master of Science degree in Mechanical Engineering in 1964. I received a Ph.D. degree in Engineering from Kensington University in 1979; Kensington University closed its doors in 2003 and is no longer active. My doctoral dissertation was on Hi-Rate Sand Filters, the filters of choice for drinking water and swimming pools.

I. I am the named inventor on thirteen (13) U.S. Patents, eight (8) Canadian Patents, and two (2) Spanish Patents for swimming pool equipment.

J. I was the Director of Engineering of Swimquip, a major swimming pool equipment manufacturer in El Monte, California, for ten years. Swimquip manufactured, tested, and sold approximately 50,000 swimming pool 110-volt and 220-volt single-phase pumps per year, ranging from 1/3hp to 3hp. These pumps were listed by the National Sanitation Foundation (NSF) and the Underwriters Laboratory (UL). Swimquip also manufactured, tested, and sold approximately 30,000 residential and commercial swimming pool filters per year which were listed by National Sanitation Foundation (NSF) under their Standard 50. I

was in charge of the corporate safety program which met monthly and investigated any safety and technical issues that were brought forth by salesmen, staff, and customers.

K. I have been retained in 907 aquatic cases which have been adjudicated in both Superior Court and Federal Court over the last 35-plus years. I have testified as an expert witness 299 times in deposition and 84 times in trial. I have never been disqualified by any court of law from presenting expert testimony.

L. From 1987 until 1997, I was a member of the U.S. Consumer Product Safety Commission's (CPSC) and National Spa & Pool Institute's (NSPI) National Swimming Pool Safety Committee (NSPSC). I was also on the NSPSC's Steering Committee and Research Sub-Committee. As part of my duties, each year I personally reviewed approximately four hundred CPSC aquatic accident investigations, including diving accidents. The NSPSC, based on the investigation and research, developed recommendations and programs for the CPSC. The NSPSC developed swimming pool safety tips and standards that were followed by most state and local environmental health departments.

M. I served on the National Spa and Pool Institute's (NSPI) Technical Council from 1974 to 1981. I also served on the International Association of Plumbing and Mechanical Officials (IAPMO), Uniform Swimming Pool Code Committee from 1974 to 1981. In addition, I served on the National Sanitation Foundation's (NSF) Standard Number 50 Joint Committee (Circulating System Components for Swimming Pools, Spas or Hot Tubs) from 1974 to 1992.

N. I served on the Board of Directors for the National Swimming Pool Foundation (NSPF) continuously from 1983 to 2010 (27 years). The NSPF is a non-profit organization dedicated to improving public health worldwide by attracting more people to safer aquatic environments. The NSPF is the leading educator for pool and spa professionals who service and operate public and private pools and spas and for public health officials who are responsible for pool safety, and is committed to improving public health by encouraging healthier living through aquatic education and research. I also served as Secretary of the

NSPF. Among other duties, I was Chairman of the Aquatic Safety Compendium Committee, which produced the Aquatic Safety Compendium in 2006. In this Compendium, I authored Chapter 7: Suction Entrapment.

O. I am a member of the Executive Committee and the Board of Directors for the California Spa and Pool Industry Education Council (SPEC). I have served on the Board of Directors since 1976, and have served on the Executive Committee for over 25 years. SPEC is a Sacramento-based organization that influences legislation in the State of California for swimming pools and spas. SPEC was the sponsor of the California 1997 Senate Bill 873 and California 2002 Senate Bill 1726 which were passed into law. Both of these bills concerned suction entrapment prevention. I drafted the technical side of both bills.

P. I was one of the contributors to the 1982 and 2012 revisions of the California Swimming Pool Code (Title 22 & 24) of the California Health and Safety Code, California Administrative Code and Uniform Building Code. The full title of this code is “The Design, Construction, Operation and Maintenance of Public Swimming Pools”. This is basically the present California State Commercial Swimming Pool Code.

Q. For over 39 years, I have been engaged in basic research on suction entrapment and have tested and written extensively on the subject since my first suction entrapment testing in June of 1974. I pioneered the development of suction entrapment testing methodology and personally acted as a test subject hundreds of times in the last 30 years. I have authored or co-authored over 20 articles, papers, and research studies on suction entrapment.

R. I was retained by the Superior Court of the State of California to investigate and report to the Court on 84 Southern California residential swimming pools that possibly suffered earthquake damage from the 1994 Northridge Earthquake. I was also retained by a leading Southern California developer as an expert to investigate and report on differential settlement damage to over 50 residential swimming pools in a large Orange County hillside housing tract.

S. I designed the circulation system on the White House swimming pool in the mid-1970s. In the early 1980s, I designed the swimming, diving, and synchronized swimming pools for the XXIII Olympiad in Los Angeles. I designed and coordinated the construction of swimming pools/training tanks for NASA, the U.S. Army, the U.S. Navy, the U.S. Air Force, and the U.S. Marines. In 2005, I completed the design of 3 new pools for the Arvin Gymnasium at the United States Military Academy, West Point, New York.

T. I have taught Swimming Pool Programming, Design, Construction and Operation at various California State Schools and Universities and Harvard's Graduate School of Design in 1994 and 1996.

U. I received the 1985 Spes Hominum Award (For the Good of Mankind) from the National Sanitation Foundation (NSF) for my research and work on water filtration.

V. In 1999, I received the Visiting Scholar Award for my Advanced Water Treatment Lecture to the graduating class of Civil Engineers at the Mapua Institute of Technology, Inturamuros, Manila, Philippines.

W. In December 2002, I received an Honorary Doctor of Engineering Degree from the International Academy For Integration of Science and Business, Moscow, Russia for my research and work on water filtration.

X. I was awarded the Joseph McCloskey Prize for Outstanding Achievement in the Art and Craft of Watershaping in June 2008.

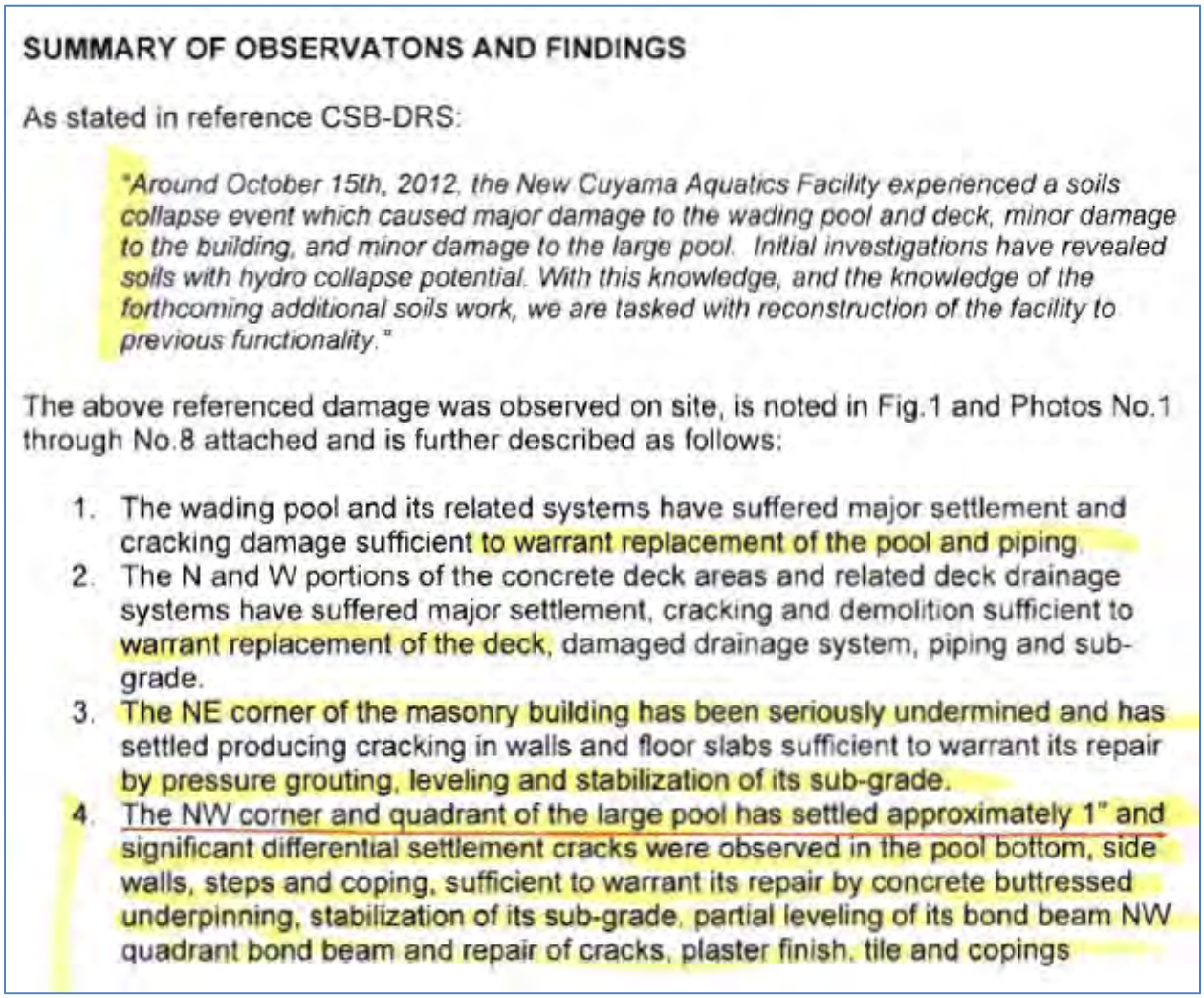
Y. My CV is attached as Appendix 1.

III. Aquatic Center Site Inspection

Figure 1: The swimming pool and wading pool at the Joseph Centeno Cuyama Pool & Aquatics Complex, New Cuyama, California.

1. Rowley International was contacted by Principal Architect Don Hertel, RA, of Westberg & White, Inc. (Architects and Planners) and asked to inspect the New Cuyama Aquatic Center pools at New Cuyama, California (See Figure 1).

2. On Wednesday, December 18, 2013, Managing Principal Greg Cannon and I drove to the offices of Westberg + White, Inc. in Santa Maria and met with Don Hertel and discussed the Aquatics Complex and the differential settlement that occurred there on October 14, 2012 (See Figures 2, 3). The three of us then drove to the Joseph Centeno Cuyama Pool & Aquatics Complex in New Cuyama for the site inspection.



SUMMARY OF OBSERVATONS AND FINDINGS

As stated in reference CSB-DRS:

"Around October 15th, 2012, the New Cuyama Aquatics Facility experienced a soils collapse event which caused major damage to the wading pool and deck, minor damage to the building, and minor damage to the large pool. Initial investigations have revealed soils with hydro collapse potential. With this knowledge, and the knowledge of the forthcoming additional soils work, we are tasked with reconstruction of the facility to previous functionality."

The above referenced damage was observed on site, is noted in Fig.1 and Photos No.1 through No.8 attached and is further described as follows:

1. The wading pool and its related systems have suffered major settlement and cracking damage sufficient to warrant replacement of the pool and piping.
2. The N and W portions of the concrete deck areas and related deck drainage systems have suffered major settlement, cracking and demolition sufficient to warrant replacement of the deck, damaged drainage system, piping and sub-grade.
3. The NE corner of the masonry building has been seriously undermined and has settled producing cracking in walls and floor slabs sufficient to warrant its repair by pressure grouting, leveling and stabilization of its sub-grade.
4. The NW corner and quadrant of the large pool has settled approximately 1" and significant differential settlement cracks were observed in the pool bottom, side walls, steps and coping, sufficient to warrant its repair by concrete buttressed underpinning, stabilization of its sub-grade, partial leveling of its bond beam NW quadrant bond beam and repair of cracks, plaster finish, tile and copings

Figure 2: Excerpt from Westberg + White, Inc. November 13, 2013 Report summarizing soils event and resulting effects.

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Water main leak blamed on sinkhole

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October 15, 2012 12:00 am • Staff report (0) Comments

A sinkhole in New Cuyama on Sunday afternoon is being blamed on a water main leak or break.

Crews responded to the incident just before 4 p.m. in the community about 60 miles east of Santa Maria, according to Capt. Mike Klusyk of the Santa Barbara County Fire Department.

The 30-foot sinkhole did not cause any injuries or damage any structures. However, Klusyk said the "kiddie pool" at the Joe Centeno Cuyama Pool and Aquatics Complex appears to be affected.

Additionally, a portion of Wasioja Street between Morales and Esquela streets is closed due to potential undermining of the roadway.

However, traffic on Highway 166 linking the Central Coast and the San Joaquin Valley wasn't affected by the incident, according to Klusyk.

Figure 3: Article from the Santa Maria Times about the soils/differential settlement event that occurred on Sunday, October 14, 2012 (http://santamariatimes.com/news/local/water-main-leak-blamed-on-sinkhole/article_8daf85d4-168c-11e2-8cc6-0019bb2963f4.html).

3. The Aquatics Complex has 2 pools: a 4-lane, 25-yard-long swimming pool with a stepped entry along one side at the shallow end, and a round wading pool (See Figures 1, 4).

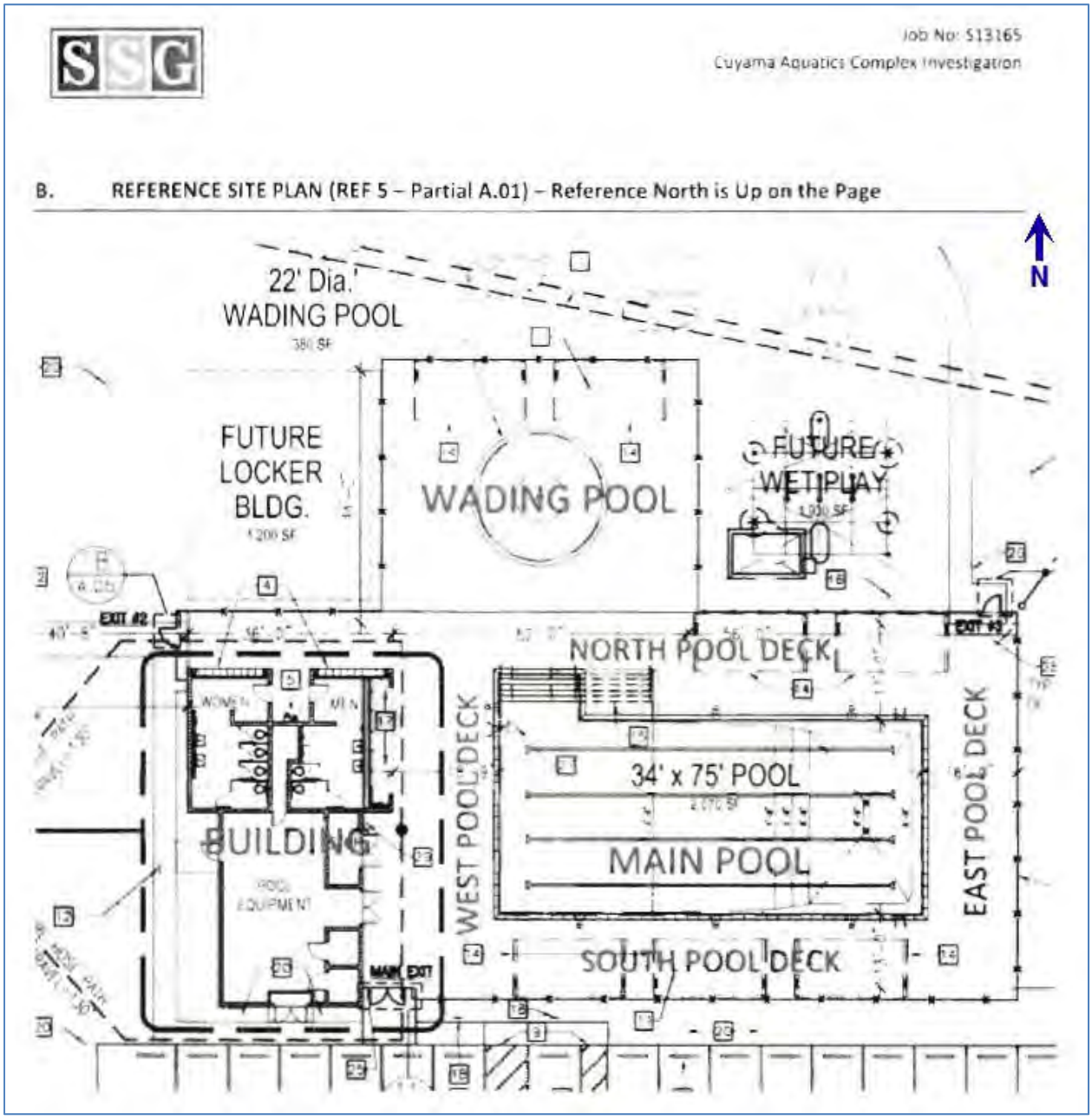


Figure 4: Excerpt from SSG Soils Report showing layout of the site.

4. The swimming pool is approximately 34 feet 6 inches (34'-6") wide by 25 yards or 75 feet (75') long and ranges in depth from 3 feet 6 inches (3'-6") to 6 feet 6 inches (6'-6")(See

Figure 4). The break in slope from the shallow end to the deep end occurs at the depth of 4 feet 6 inches (4'-6").

5. The wading pool has a diameter of 22 feet (22') and ranges in depth from 12 inches (12") to 18 inches (18") (See Figure 4).

6. When we first approached the pool area, it was obvious that the wading pool had suffered massive differential settlement. The deck around the wading pool had settled at a different rate from the wading pool; the wading pool coping had separated from the wading pool (See Figure 5). The wading pool's bond beam was cracked.

Figure 5: Photo of the wading pool showing the deck separating from the wading pool coping and the wading pool coping separating from the pool. On the left side of the photo, it can be seen that the wading pool's bond beam has cracked through the waterline tile. Also on the left side of the photo, an 11-inch (11") core taken from the wading pool floor can be seen (See Figure 6).

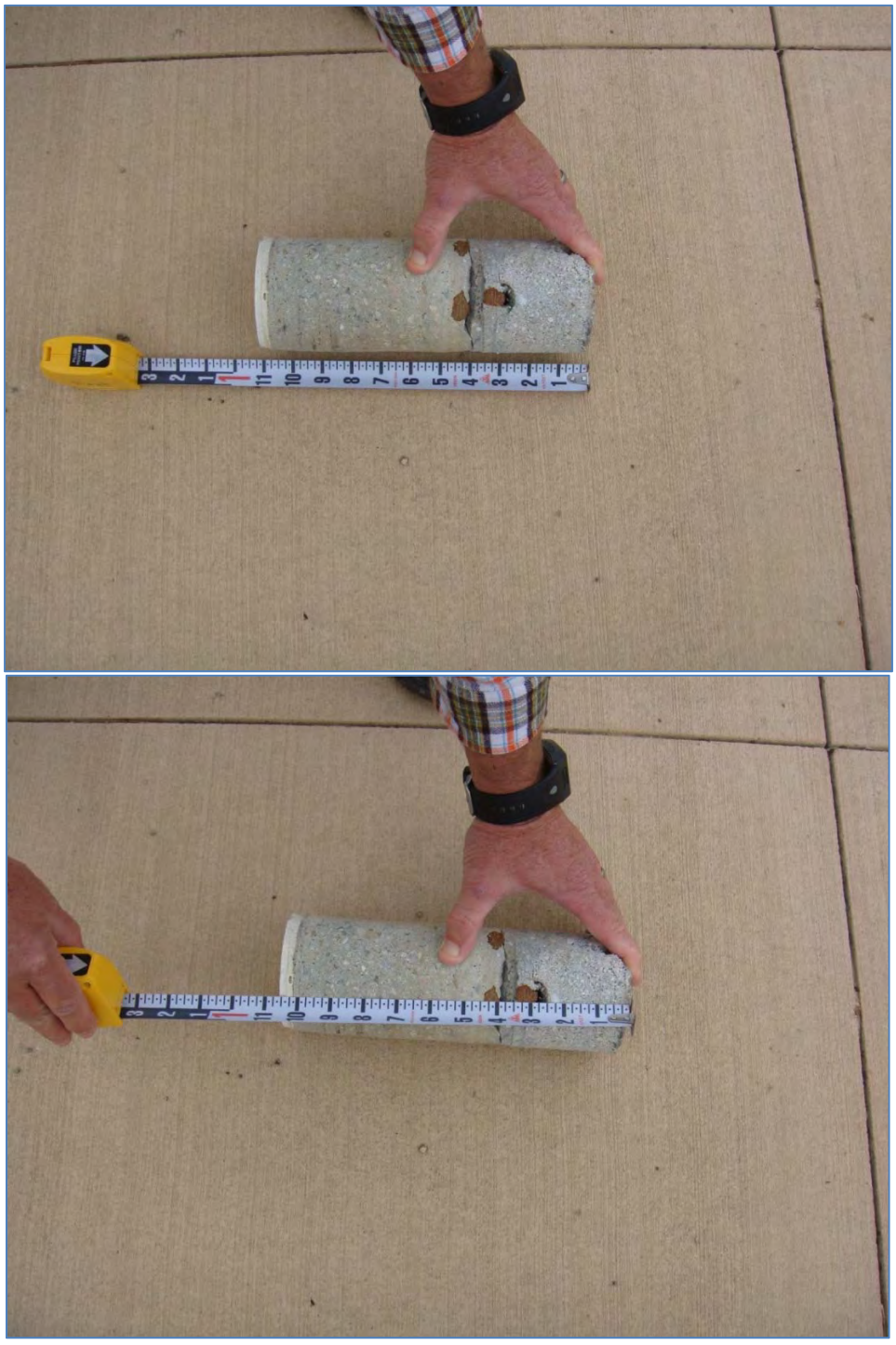


Figure 6: Measurements of the 11-inch (11”) core taken from the floor of the wading pool. Drawing SP-7 required that thickness of the wading pool floor be 6 inches (6”) thick. The pool contractor did better than the requirements and made a stronger wading pool floor. It is also noted that the structural steel is approximately 3 inches (3”) off the dirt, which is per code requirements.

7. Due to the exposure of some of the piping, we were able to determine that the pool contractor utilized Schedule 80 PVC (max working pressure 400 lbs.) for the pool piping (See Figure 7), which is much stronger and more durable than the Schedule 40 PVC pipe (max working pressure 240 lbs.) specified in the drawings. Schedule 80 PVC pipe has approximately 40% more wall thickness than Schedule 40 PVC pipe. The tensile strength of all PVC is 7,300 psi.

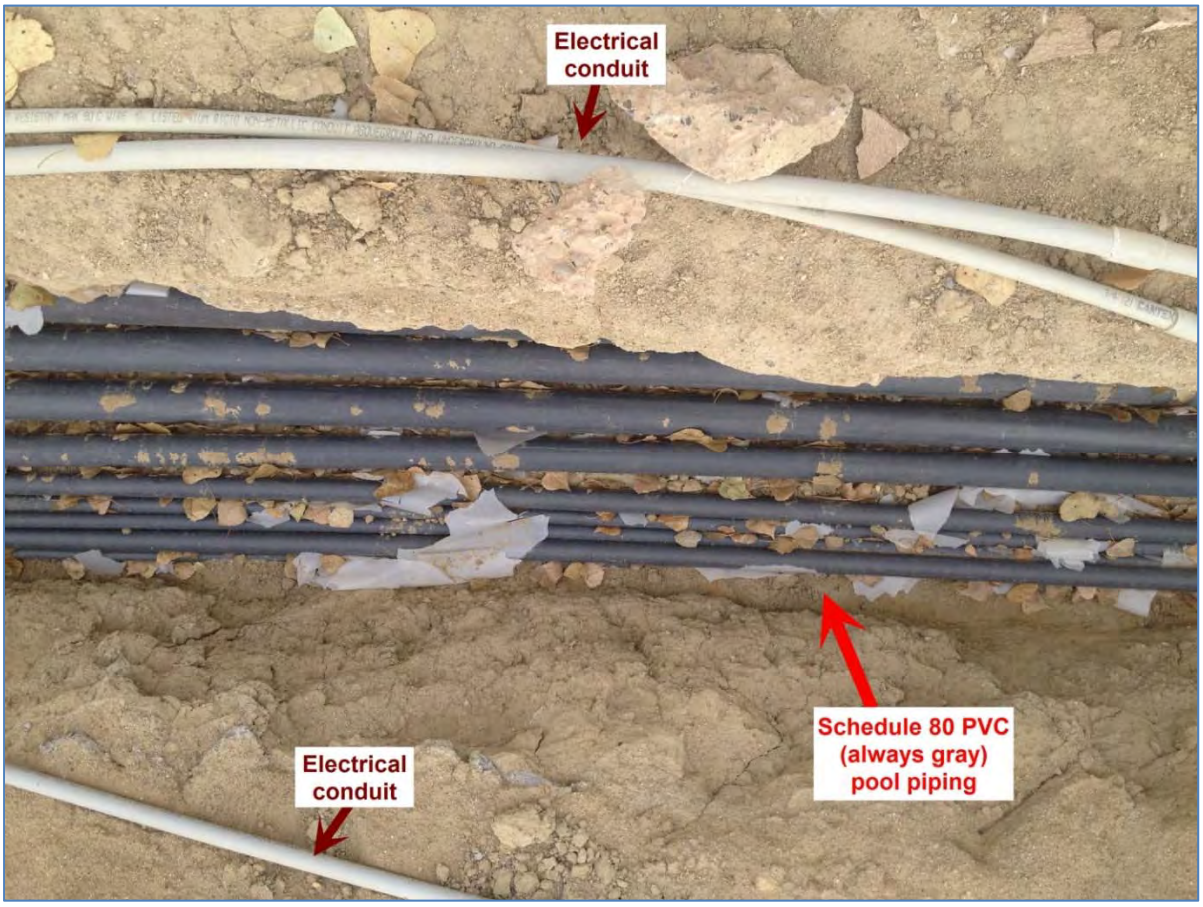


Figure 7: Photo of Schedule 80 PVC pipe put in by the pool contractor.

8. At this time, we concur with most of the previous assessments regarding the cause of the hydroconsolidation or differential settlement (See Figures 2, 8-22). On Sunday, October 14, 2012, the New Cuyama Aquatics Complex experienced hydroconsolidation resulting in a soils collapse (See Figures 2, 8-22). We understand that most of the hydroconsolidation or differential settlement occurred over a period of 6 to 10 hours on the above date (See

Figure 9). This soils collapse was caused by a large water leak that inundated the subsurface material and caused the hydroconsolidation or differential settlement (See Figures 2, 8-22).

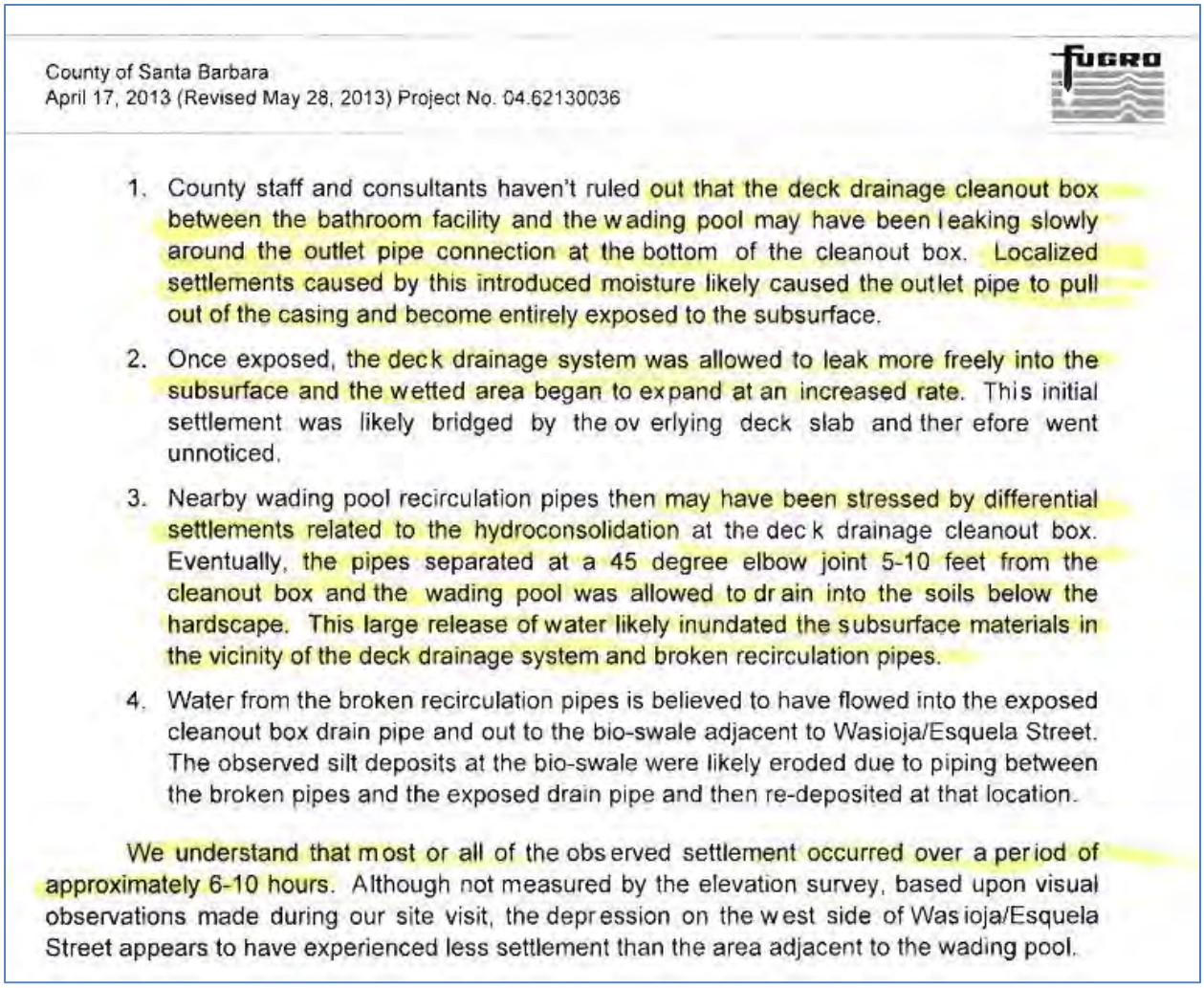
9. If the thickness of the wading pool floor is consistent with the 11-inch-(11")-thick core (See Figures 5, 6), then the weight of the wading pool floor would be approximately 57,000 lbs.; when this structure began settling, the movement (the differential settlement) would have severely stressed the inground circulation pipes. During the differential settlement event on October 14, 2012, what occurred was the stress that the wading pool put on its circulation piping under and around the wading pool was considerably more than the piping was designed to resist. Two of the pressurized circulation pipes to the wading pool were pulled loose from their fittings by the differential settlement of the wading pool, which then introduced more water into the ground and exacerbated the situation (See Figure 9).

POST-EVENT FORENSIC OBSERVATIONS BY COUNTY

The observations made by county officials following the event offer important insight useful in evaluating the potential causes of the settlement at the facility. In a preliminary attempt to determine the cause of damage on-site, the County hired Pacific Materials Laboratory (2013) to perform an elevation survey in the affected area surrounding the wading pool. The results indicated that settlements of as much as 12 inches had occurred. In addition, the soil in the immediate vicinity was excavated to expose the adjacent pool plumbing and deck drainage systems. Upon inspection of these systems County staff observed that a deck drainage pipe had pulled out of the bottom of a near by cleanout box, and two adjacent wading pool recirculation pipes had separated at a 45 degree elbow joint. County personnel also observed a significant amount of silt deposited in the bio-swale and dry well located west of the facility that serves as the outlet point for the deck drainage system. They reported that the vertical perforated polyvinyl chloride (PVC) pipe in the dry well was filled with silt to within 30 inches of the top of pipe. Witnesses reported that ponded water was visible at the ground surface on the other side of Wasioja/Esquela Street and opposite the bio-swale after this event. County staff observed that settlement may have also occurred in this area.

Based on the above observations, the list below outlines our understanding of the likely sequence of events leading up to and following the observed settlements:

Figure 8: Excerpt from Fugro Consultants April 2013 (Revised May 2013) Report Page 4.



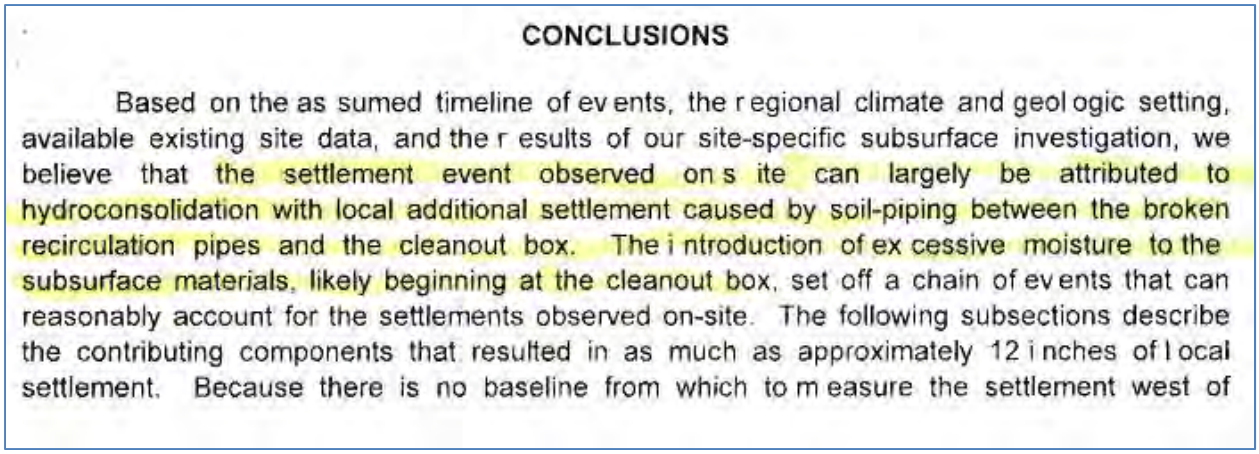
County of Santa Barbara
April 17, 2013 (Revised May 28, 2013) Project No. 04.62130036

FUGRO

1. County staff and consultants haven't ruled out that the deck drainage cleanout box between the bathroom facility and the wading pool may have been leaking slowly around the outlet pipe connection at the bottom of the cleanout box. Localized settlements caused by this introduced moisture likely caused the outlet pipe to pull out of the casing and become entirely exposed to the subsurface.
2. Once exposed, the deck drainage system was allowed to leak more freely into the subsurface and the wetted area began to expand at an increased rate. This initial settlement was likely bridged by the overlying deck slab and therefore went unnoticed.
3. Nearby wading pool recirculation pipes then may have been stressed by differential settlements related to the hydroconsolidation at the deck drainage cleanout box. Eventually, the pipes separated at a 45 degree elbow joint 5-10 feet from the cleanout box and the wading pool was allowed to drain into the soils below the hardscape. This large release of water likely inundated the subsurface materials in the vicinity of the deck drainage system and broken recirculation pipes.
4. Water from the broken recirculation pipes is believed to have flowed into the exposed cleanout box drain pipe and out to the bio-swale adjacent to Wasioja/Esquela Street. The observed silt deposits at the bio-swale were likely eroded due to piping between the broken pipes and the exposed drain pipe and then re-deposited at that location.

We understand that most or all of the observed settlement occurred over a period of approximately 6-10 hours. Although not measured by the elevation survey, based upon visual observations made during our site visit, the depression on the west side of Wasioja/Esquela Street appears to have experienced less settlement than the area adjacent to the wading pool.

Figure 9: Excerpt from Fugro Consultants April 2013 (Revised May 2013) Report Page 5.



CONCLUSIONS

Based on the assumed timeline of events, the regional climate and geologic setting, available existing site data, and the results of our site-specific subsurface investigation, we believe that the settlement event observed on site can largely be attributed to hydroconsolidation with local additional settlement caused by soil-piping between the broken recirculation pipes and the cleanout box. The introduction of excessive moisture to the subsurface materials, likely beginning at the cleanout box, set off a chain of events that can reasonably account for the settlements observed on-site. The following subsections describe the contributing components that resulted in as much as approximately 12 inches of local settlement. Because there is no baseline from which to measure the settlement west of

Figure 10: Excerpt from Fugro Consultants April 2013 (Revised May 2013) Report Page 5.

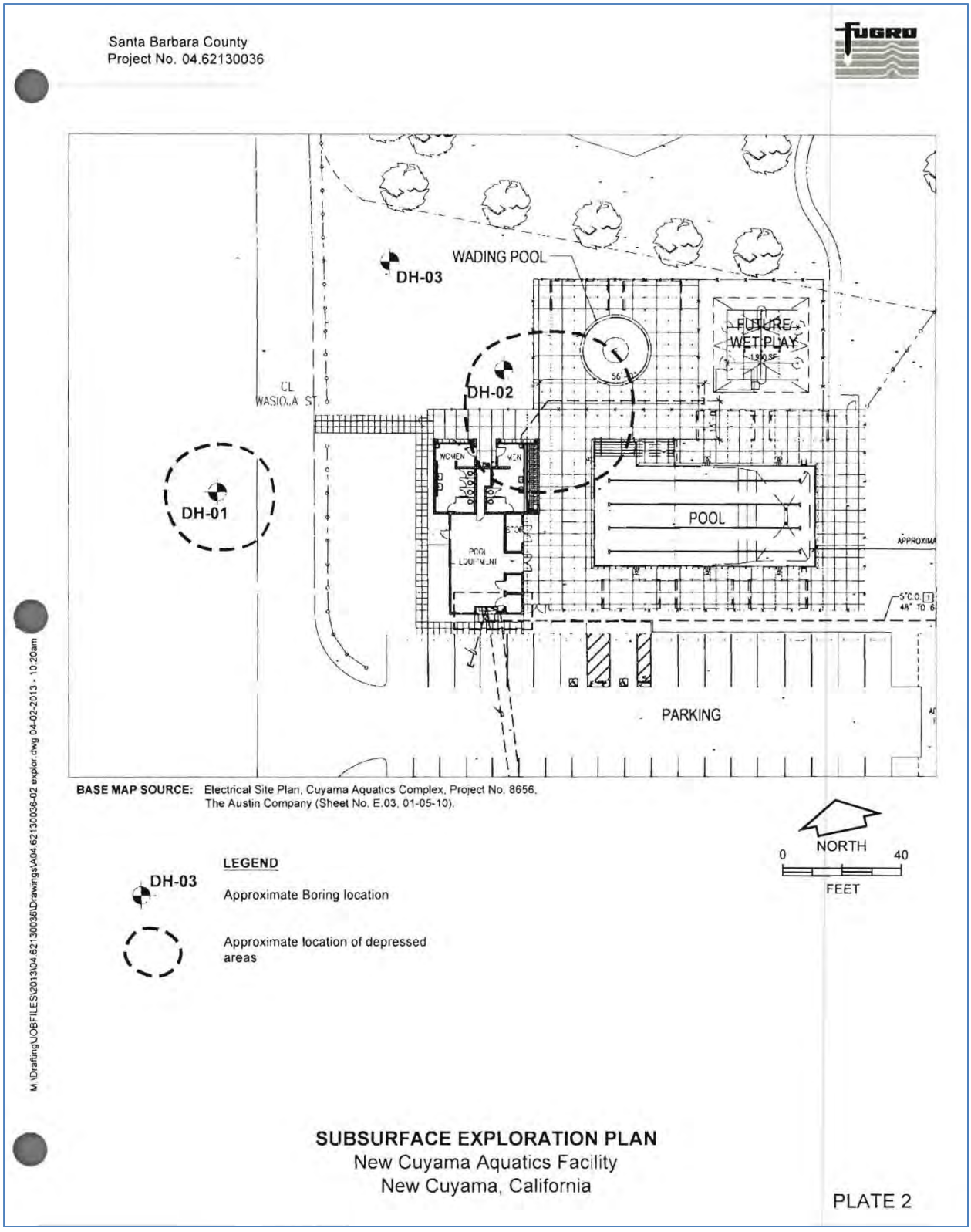


Figure 11: Excerpt from Fugro Consultants April 2013 (Revised May 2013) Report Plate 2.

1.03 10/16/13	DH/MP	Pool Area Notes 1. The northwest corner of the pool has settled approximately 1 inch, cracks are noticeable directly and diagonally across the bottom of the pool from the eastern end of the steps. The crack extends up the pool wall and along the deck joint at the east end of the steps. The settlement is evidenced by the waterline mark, which indicates it may have occurred some time ago.

Figure 12: Excerpt from Meeting Minutes (10/16/13 Site Visit), New Cuyama Pool Incident Reconstruction, Minutes No. 1 – Initial Site Visit, noting that the 1" settlement of the northwest corner of the [swimming] pool is evidenced by the waterline mark.

13. The location of the primary sink hole event and surface discoloring of the concrete deck area adjacent to the outdoor shower area suggest that the weaknesses in the drainage system construction may have been made worse by the constant wetting of the sink hole area by shower spray and the traffic of pool users from the pool steps to the showers and restroom areas. It is likely that the sub-soil failure was gradual at first as water seeped down from unsealed slot drains in the deck and from the unsealed collection inlet box serving the area. As the area began to subside, the expansion joints adjacent to the building would have started to fail increasing water intrusion. Because of the relative stiffness of the concrete deck, below deck slab subsidence may have increased to the point where pressure pipe connections began to fail without being noticed on the surface. Once the pressure pipes burst, the washout and deck collapse would have occurred rapidly. Consideration should be given to modifying the outside shower area design to limit excessive overspray onto the pool deck.

Figure 13: Excerpt from Meeting Minutes (10/16/13 Site Visit), New Cuyama Pool Incident Reconstruction, Minutes No. 1 – Initial Site Visit, noting the probable exacerbation of the event.

3. The existing complex underwent substantial loss of soil support in a large area supporting the wading pool, main pool, pool deck and a portion of the restroom building. This loss of support caused major differential settlement and damage of some elements.

Figure 14: Excerpt from the Smith Structural Group, LLP 11/13/13 Report, Page 2.

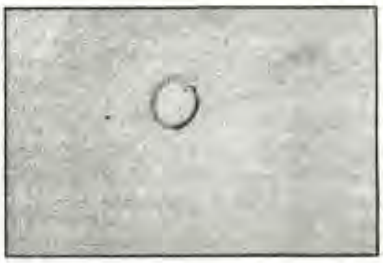
3. The pool deck is not doweled or connected to the structural foundation of the building. This is consistent with the construction documents detailing. This is also common for contemporary building construction. However in the area with the outdoor showers, this lack of continuity may have led to excessive moisture entering the sub-grade space after the initial movement occurred.

4. The slot drains and cleanouts that were installed on the North and West ends of the main pool are subject for possible long term water intrusion below the pool decks. It was documented during site observations that the installation of the details provided by the construction documents were not sealed properly at cleanouts.

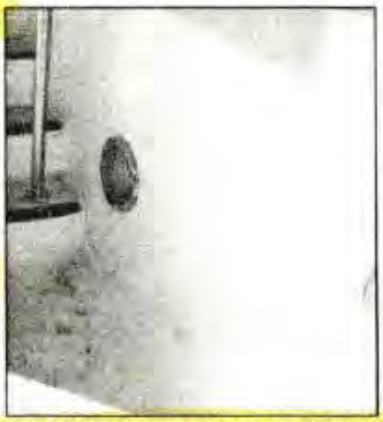
Figure 15: Excerpt from the Smith Structural Group, LLP 11/13/13 Report, Page 5.

3. Several cracks were observed during initial site observations at the main pool.

   a. Small cracks consistent with temperature and shrinkage of standard concrete construction were evident around and between various filler valve penetrations at the base of the pool. These cracks may have been enlarged do to the overnight cooler temperatures and lack of water in the pool which would expose the pool to larger than normal temperature swings.



   b. Vertical cracking was observed at the eastern edge of the stairs. The cracking telegraphed across the pool bottom, and is likely caused by tensile stresses at the abrupt change in plan geometry. The tensile stress is likely directly related to the settlement of the northwest portion of the pool.



4. Do to the loss of soil support at the northwest corner of the main pool it is evident from the waterline stain that it has settled over an inch from initial level.

5. The coring study completed by Fugro Consultants, Inc. (REF 8) determined there are no voids directly beneath the bottom of the pool lining. The Pool bottom rests directly on an 18" layer of 3/8" clean crushed rock over geo-fabric. The design documents call for a total gravel layer of 24".

6. The Wading pool has lost soil support over a major portion of its base. In addition, the majority of the pool deck surrounding the wading pool has been removed and the utility trenches excavated. The combination of these two items has caused major differential settlement of the wading pool. It can no longer function for its intended purpose and is not serviceable in its current state.

Figure 16: Excerpts from the Smith Structural Group, LLP 11/13/13 Report, Pages 5-6.

K. **Conclusions and Recommendations**

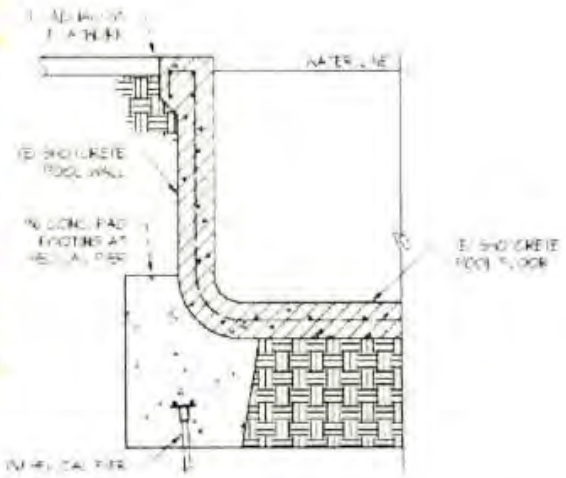
1. Prior to any full structural solution being implemented to retrofit any portion of the complex, additional geotechnical recommendations will be required for current design values. In addition, design information and feasibility of lateral support related to underpinning will be required. The Geotechnical Engineering consultant shall be given the opportunity to review and comment regarding the contents of this report.

4. Main Pool

   a. The main pool's performance must be evaluated in its current state of settlement at the northwest end. A qualified pool expert should advise the design team that all pool systems would operate at full capacity as intended should it be stabilized in its current condition.

   b. Lifting or leveling the pool in position is not structurally advisable, as this may cause more damage or new voids at the bottom or sides of the structure. It is recommended that the pool be stabilized in place on the West end of the pool where soil collapse was prevalent.

   c. The stabilization of the main pool shall be achieved by underpinning with helical piers with cap brackets and thrust blocks of reinforced concrete. This solution will require excavation of the soil directly adjacent to the pool walls in the shallow west end. This operation will be most successful should it be done in stages much like a 'checkerboard' grading operation.



   d. Per the original soils report by GSI Soils, Inc. the Main Pool should have been constructed with a drainage system under and around the pool connected to a sump pump. It is recommended that a system similar to that recommended in the original report be designed and subsequently installed during the exposure of the West end of the main pool.

   e. Replacement or repair of the pool's plaster finish will be required to repair cracks and potential for future leaks.

5. Wading Pool

   a. Supplemental support and repair for the existing wading pool is not feasible. It is recommended that the wading pool be removed and replaced in its entirety per the original plans.

   b. Geotechnical recommendations will be required to replace or augment the existing subgrade which had been previously prepared with on-site native soils. These on-site native soils have subsequently been determined to have hydroconsolidation potential.

Figure 17: Excerpts from the Smith Structural Group, LLP 11/13/13 Report, Pages 8-10.

Based on site observations noted in reference WW-MM01 and our review of the other documents referenced above, we generally support the Fugro sequence of events and make the following additional observations regarding observed settlements and existing conditions within and surrounding the New Cuyama Aquatics Complex:

1. The original soils report GSI-SR did not mention the hydro-consolidation potential of the on-site soils and did not call for pre-consolidation of the soils other than compaction. It permitted over-excavated on-site soil material to be reused as structural fill, thus relying upon the impermeability of decks, pools, drainage systems, pressure piping systems and joint materials to prevent water intrusion and potential hydro-consolidation of the compacted construction pad. When these systems failed to prevent leakage, the underlying hydro-consolidation potential was realized and in our opinion precipitated the collapse event. To the extent that these soils remain in place after reconstruction, there will always be a possibility of water intrusion from a pressure line leak or some unanticipated source and therefore, the possibility of another settlement or collapse event.

2. The area between the NE corner of the restroom building, the large pool and the wading pool was subjected to more frequent wetting from the exterior showers (Photo No.9) and from foot traffic between the pool steps, the restrooms, the showers and the drinking fountains, which would have accelerated any localized settlement due to slow leakage through the deck, expansion joints or deck drains.

Figure 18: Excerpt from Westberg + White, Inc. 11/13/2013 Report, Page 3.

6. The following additional observations are made concerning the condition of the large pool:

   a. Reference FCI-GDR also notes that it would be beneficial to perform a manometer survey of the bottom of the pool bottom slab and of the perimeter deck tiling (*and coping*) to determine whether or not the pool has been displaced due to hydro-consolidation. We suggest that a similar survey should be done to determine the degree and extent to which the masonry building has settled at its NE corner.
   b. The main pool drain inlets at the low end of the pool have standing water (Photo No.15). No drainage outlet other than the pump suction line is provided and it is assumed the water is trapped water resulting from the pump shut off. These will need to be cleaned and examined for any deficiencies during reconstruction.
   c. A large number of cracks and a few areas of coping separation were observed at the large pool (Refer to Photos No. 17 - 19).
      - Diagonal and 90-degree trans-pool cracking patterns emanating from the E side of the steps indicate settlement of the entire NW corner of the shallow portion of the pool (Photo No. 17).
      - 90-degree trans-pool cracking parallel and proximate to the pool bottom slope-break lines indicates possible differential settlement of portions of the pool bottom (Photo No. 18).
      - Spider-like cracking associated with the pool bottom water inlets may indicate insufficient reinforcement of the areas around penetrations, or expansion and contraction cracking along stress lines created by the inlet pipe slab penetrations, also possibly related to direct sun on the empty pool bottom (Photo No. 19).
   d. Numerous ameba-like eroded patches are present on the surface of the one inch thick plaster pool lining, possibly due to chemical reactions occurring in standing water puddles following empting of the pool (Photo No. 20).

Figure 19: Excerpt from Westberg + White, Inc. 11/13/2013 Report, Page 5.

3. We recommend the inclusion of an aquatics facility design firm, other than ADG, on the WW reconstruction team. This additional consultant would also review and comment on these Pre-design Report recommendations with respect to the establishing the scope of pool re-commissioning requirements and with particular emphasis on the operational and long range feasibility of stabilizing and operating the large pool in its present out-of-level condition rather than attempting to level it or demolishing and replacing it.

Figure 20: Excerpt from Westberg + White, Inc. 11/13/2013 Report, Page 7.

except where infeasible or where improvements are justified and approved by the County.

Repairs directly related to the soil collapse event:

1. Demolition and Site Preparation:

   a. Note that the contractor shall be responsible for job safety, including perimeter fencing pedestrian protection, worker safety, shoring design and placement and protection of all existing construction to remain.
   b. Demolish and remove all existing damaged construction within the existing pool enclosure fencing, including stockpiled materials, collapsed decking and damaged portions of the large pool, including out-of-level copings and tile. Remove damaged portions of the existing one inch plaster interior pool finish and sandblast the entire surface in preparation for refinishing.
   c. Saw-cut and remove a portion or portions of the existing damaged concrete floor slab within the Men's restroom, including the existing floor drain(s) and drain piping in order to access the sub-grade for foundation repairs and to repair the floor slab.
   d. Remove and salvage all reusable existing improvements and equipment interfering with reconstruction and store for re-installation. At the existing chain link fencing to remain, roll-up the lower portion of the chin link to facilitate preparations for new work.
   e. Remove all loose soils, debris within the areas of reconstruction within the existing building and pool enclosure fencing and over-excavate the exposed sub-surface soils under the observation and direction of the soils engineer until competent material is reached. Scarify and re-compact the exposed material per the reconstruction soils report. Avoid undermining of adjacent structures and provide shoring, designed by a licensed professional engineer as needed.
   f. Remove all hydro-consolidation prone soil below the wading pool and 5 feet beyond the wading pool perimeter. Over-excavate and reinstall the wading pool sub-grade per the recommendations of the reconstruction report.
   g. Remove clear, grub and remove all existing landscaping and irrigation piping within eight feet outside of the existing pool at fence line along the northerly and easterly perimeter of the facility to prepare for installation of new non-irrigated decomposed granite surfacing.
   h. Saw-cut and remove an approximately 12-inch wide strip at the edge of the existing deck perimeter as needed to prepare for installation of new deck edge perimeter drains.

2. Earthwork and Underground Utilities Reconstruction:

   a. The WW reconstruction team shall establish test methods and criteria to examine and test all existing utilities for serviceability and damage. Replace all damaged underground utility lines and conduit to match existing construction, rough-in for new connections and accessories.
   b. Back-fill utility trenches per the reconstruction soils report.

Figure 21: Excerpt from Westberg + White, Inc. 11/13/2013 Report, Page 8.

c. Install new large pool concrete buttressed underpinning and sub-grade stabilization.
d. Install new masonry building grade beam and underpinning, pressure grouting, leveling and sub-grade stabilization.
e. Place and compact new structural fill and wading pool gravel base layer to new sub-grade levels per the reconstruction soils report.
f. Place and compact a new concrete deck base layer per the reconstruction report.
g. Excavate for new trench drains around the northerly and westerly sides of the large pool.

3. Large Pool Repairs:

a. Inspect, test and repair all large pool piping, fittings and equipment, including pool area and equipment room equipment and repair or replace as needed.
b. Level the top of the exposed portion of the existing settled bond beam at the NW quadrant and reinstall coping and tile to match existing.
c. Patch and repair all cracks by epoxy injection or other appropriate means.
d. Resurface the entire plaster pool finish and restore all painted graphics.
e. Repair any damaged pool bottom tile.
f. Clean, restore and/or reconstruct all damaged large pool finish surfaces, hardware, accessories and fittings per the original plans, including the repair of cracked copings, cracked tile work graphics, inlets and drains, etc.

4. Wading Pool and Deck Reconstruction:

a. Reconstruct the wading pool bottom and sides consistent with the original plans, except provide additional reinforcing bars around bottom penetrations. Reinstall and/or replace all salvageable wading pool equipment.
b. Repair cracks in the exposed large pool perimeter by epoxy injection.
c. Overlay the new concrete deck base layer, and cover below all slot drain and cleanout box excavations with a waterproof under slab barrier such as the WR Meadows PMPC underslab system (see Fig.2) having all penetrations sealed. The waterproof barrier shall be turned up at the sides of the wading pool, large pool and at existing building footings and sealed per manufacturer's recommendations to form an impervious layer below the new deck areas.
d. Install sub-drainage piping and gravel at the exposed wading pool perimeter. Install perimeter trench drains, such as the factory manufactured HDPE type shown in Fig.6, with stainless steel grates, sealed joints, at the new deck edges. Run the drainage lines to a new sump pump (see example at Fig.7) with discharge to the sanitary sewer – to be designed by the WW team Civil Engineer.
e. Replace existing deck area plastic cleanout and drainage inlet boxes with new factory manufactured HDPE types such as the Zurn products shown in Figs. 4 and 5, with stainless steel grates, sealed joints, and connect to the new storm drain piping.

Figure 22: Excerpt from Westberg + White, Inc. 11/13/2013 Report, Page 9.

10. We concur with the previous assessments that the differential settlement has made the wading pool unusable and irreparable (See Figure 2, 16, 17). We concur that the wading pool will need to be completely removed and replaced.

11. At our site inspection, we first set up a precision level and took measurements of the elevation of the pool coping around the swimming pool (See Figures 24-26) and around the wading pool.

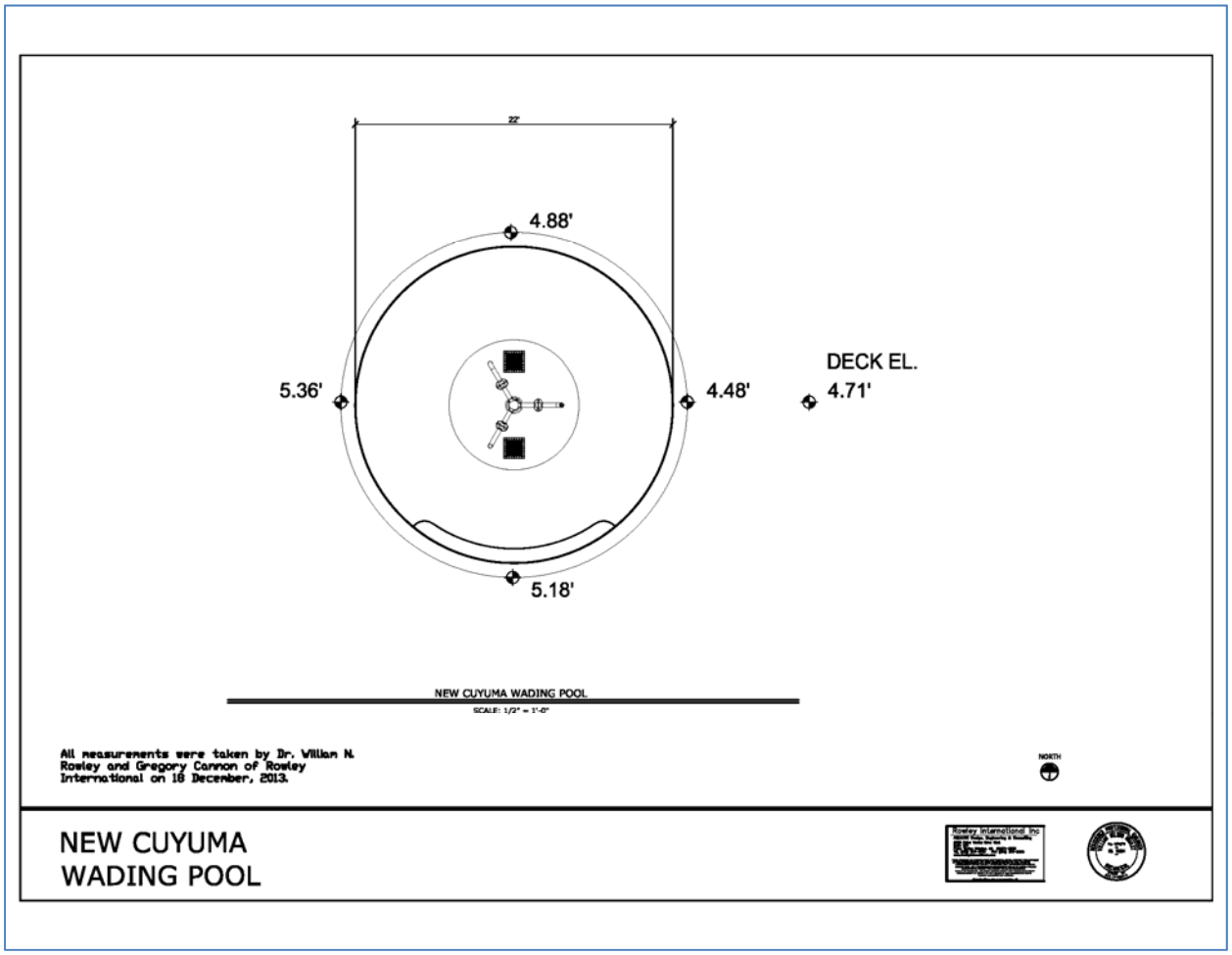


Figure 23: Diagram of the elevation measurements taken around the wading pool at the Rowley International site inspection on December 18, 2013.

12. We took four elevation measurements around the wading pool, one in each quadrant (See Figure 23). The measurements showed that greatest difference (5.36 feet minus 4.88 feet) was 0.48 feet (0.48'), or approximately 6 inches (6"), which is consistent with the amount of deck settlement at the corner of the building (See Figure 27). The wading pool at its highest point (these measurements were off the coping) was 4.88 feet (4.88'). Its lowest point was 5.36 feet (5.36').

Figure 24: Photo of Managing Principal Greg Cannon holding the measuring rod on the south side of the swimming pool. The northwest corner of the swimming pool (and the area with the most differential settlement) can be seen in the right background.

Figure 25: Photo of Principal Architect Don Hertel, RA, holding up the measuring rod at the southeast corner of the swimming pool. From the measurements, this corner had the highest elevation of any point on the pool coping. Note the skimmers in the pool wall.

13. We took eleven level measurements around the swimming pool on the pool coping (See Figures 24-26). We determined that the difference in elevation between the highest and lowest corners (4.83' minus 4.54') is 0.29 feet (0.29') or 3.5 inches (3-1/2"). We surveyed the elevation of the northwest corner of the swimming pool (the lowest corner and where the most differential settlement or subsidence occurred) and found it to be 4.83 feet (4.83'). We surveyed the southeast corner of the swimming pool (the highest corner) and found the elevation to be 4.54 feet (4.54'). This is the second-worst case of differential settlement I have seen in a pool in 50 years of practice.

14. In previous reports, it was stated that the differential settlement in the pool was approximately one inch (1") (See Figures 2, 12, 16). From the reports, it appears that this measurement was indicated by the waterline witness mark (See Figures 12, 16). Waterline witness marks are whitish calcium deposits made over time at the water level. The waterline witness mark would have been made before the swimming pool was drained. If the swimming pool was drained during or within days after the soils collapse event, then the waterline witness mark would indicate how much the swimming pool settled prior to the soils collapse event on October 14, 2012.

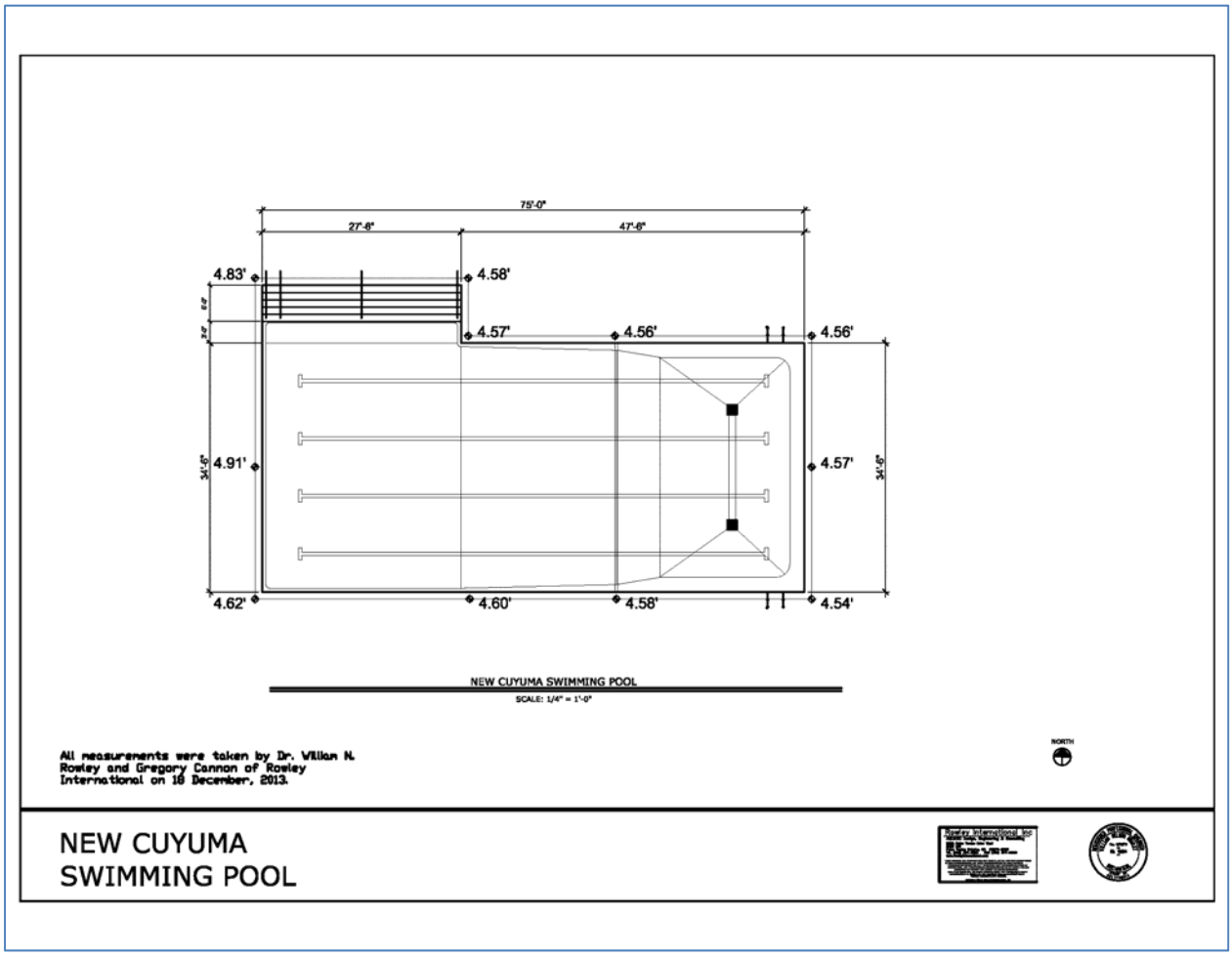


Figure 26: Elevation measurements taken around the swimming pool at the Rowley International site inspection on December 18, 2013.

15. As shown above, we measured differential settlement in the swimming pool from the northwest corner to the southeast corner to be 3.5 inches (3-1/2”; See Figure 26). **The swimming pool has continued to settle further than indicated by the waterline witness mark.**

16. The northwest corner of the swimming pool is currently 3.5 inches (3-1/2”) below the southeast corner of the swimming pool (See Figure 26). Swimming pools are designed so that the skimmers normally operate with the water level halfway up the 6-inch (6”) skimmer throat. In this method, the skimmers are operated with a plus-or-minus-3-inch (±3”) margin of safety (i.e., the pool water level can increase or decrease up to 3 inches (3”) without affecting skimmer operation). This is no longer the condition of the swimming pool.

17. The 3.5-inch (3-1/2”) differential settlement is too great for the skimmers to operate as designed. If an attempt is made to operate the swimming pool in its current condition (and assuming the swimming pool does not experience further differential settlement), it is barely possible for the water level to be set so that the skimmers can be simultaneously operated, but there is no margin of safety for any changes in the water level (e.g., influx of bathers, rain, etc.).

18. If an attempt is made to operate the swimming pool in its current condition and the skimmer in the northwest corner is operated with the water at its normal operating level, the skimmer in the southeast corner will be dry and suck air which will cause the circulation pump to lose prime and would likely result in damage to the circulation pump.

19. The swimming pool structure has been geologically compromised. Any jacking or localized structural reinforcement will not work as the structural loads will be unevenly distributed through the existing structural shell, resulting in more cracking failures. Inground swimming pools are designed to be supported by the soil.

20. Additionally, the stress on the swimming pool circulation piping caused by the differential settlement has not been relieved. This unrelieved stress is what caused the wading pool circulation piping to fail. If the swimming pool has not stopped settling, the swimming pool circulation piping will suffer additional stress.

21. The differential settlement of the deck in front of the showers at the corner of the building is 6 inches (6”) below its as-built level in relation to the building (See Figure 27), which may have also settled (per Fugro Consultants’ May 2013 Report, the results of an elevation survey conducted in the area around the wading pool indicated that settlements of up to 12 inches (12”) had occurred (See Figure 8)). The differential settlement occurred in the corner of the deck by the showers. There is a gutter drain along the back wall of the shower area (See Figure 28); some splashout water from the showers would have fallen on the deck and drained into the slot drain in the deck drainage system. After the deck began settling, some of the shower water would have seeped into the ground through the separation between the deck and the building (See Figures 15, 28).

Figure 27: Closeup photo of the corner of the building seen in Figure 28. The deck at this corner settled to 6 inches (6”) below its original level in relation to the building at our inspection on December 18, 2013.

Figure 28: Photos of the shower area. Although there is a gutter drain along the back wall of the shower area, some splashout water would have fallen on the deck and drained into the slot drain in the deck drainage system. After the deck began settling, some of the shower water would have seeped into the ground through the separation between the deck and the building.

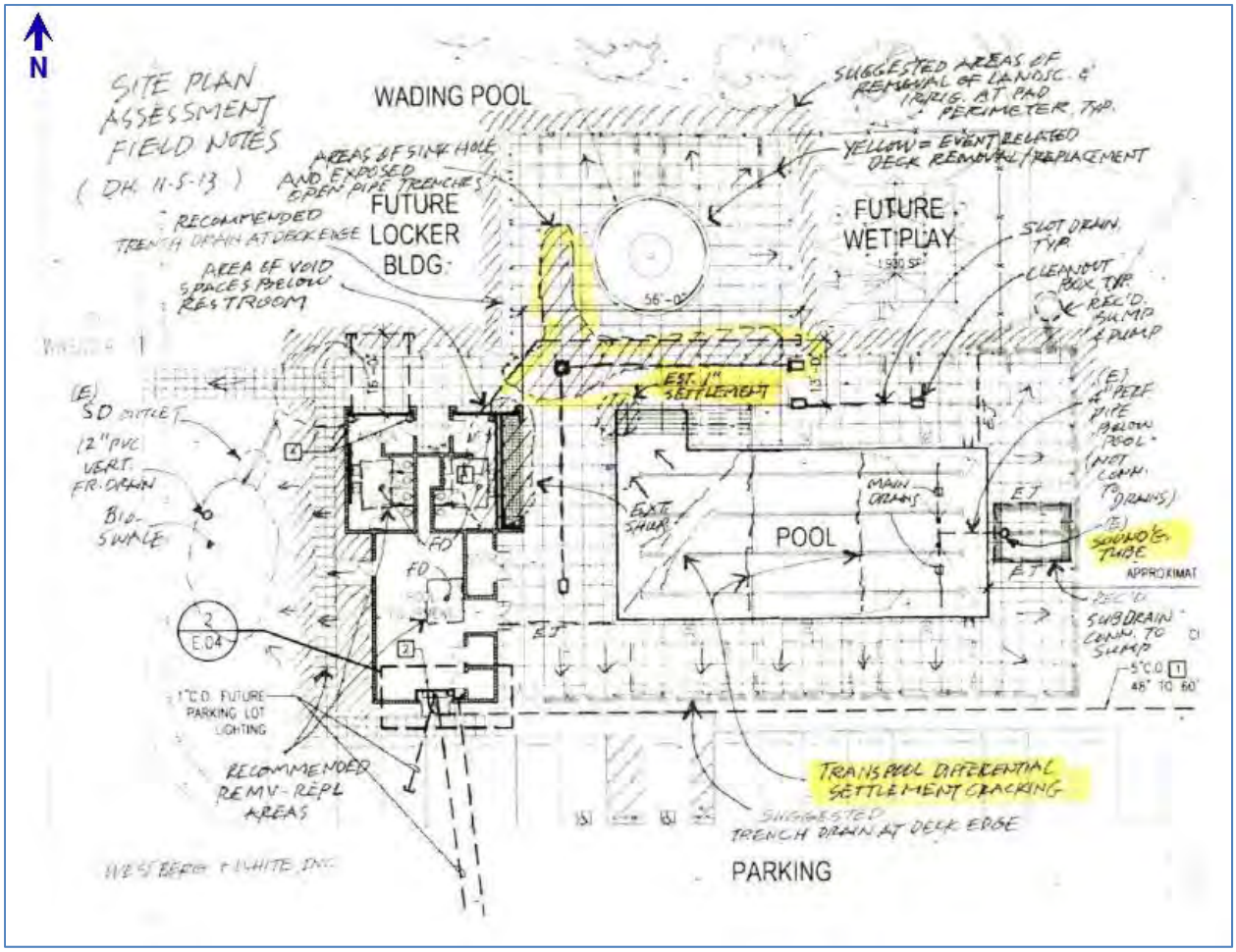


Figure 29: Excerpt from Westberg + White, Inc. Report Page 13. Note cracking in swimming pool floor.

22. The two main drain sumps were full of murky water. Greg Cannon reached in to the south main drain sump and was able to determine by touch that there was a hydrostatic relief valve in the bottom of it (See Figure 29).

23. The swimming pool cracked in three major areas (See Figures 29-32). One crack is from the corner of the stepped entry across the shallow end of the pool at approximately a 45-degree angle (See Figure 29). In many areas in the crack, we were able to get a 0.025-inch-thick feeler gauge (nearly 1/32") into the crack with no problem (See Figures 33, 34). Another large crack from the same corner goes directly across the pool to the south side wall (See Figure 29). A third large crack runs across the break in slope from the north side pool wall to the south side pool wall (See Figure 29).

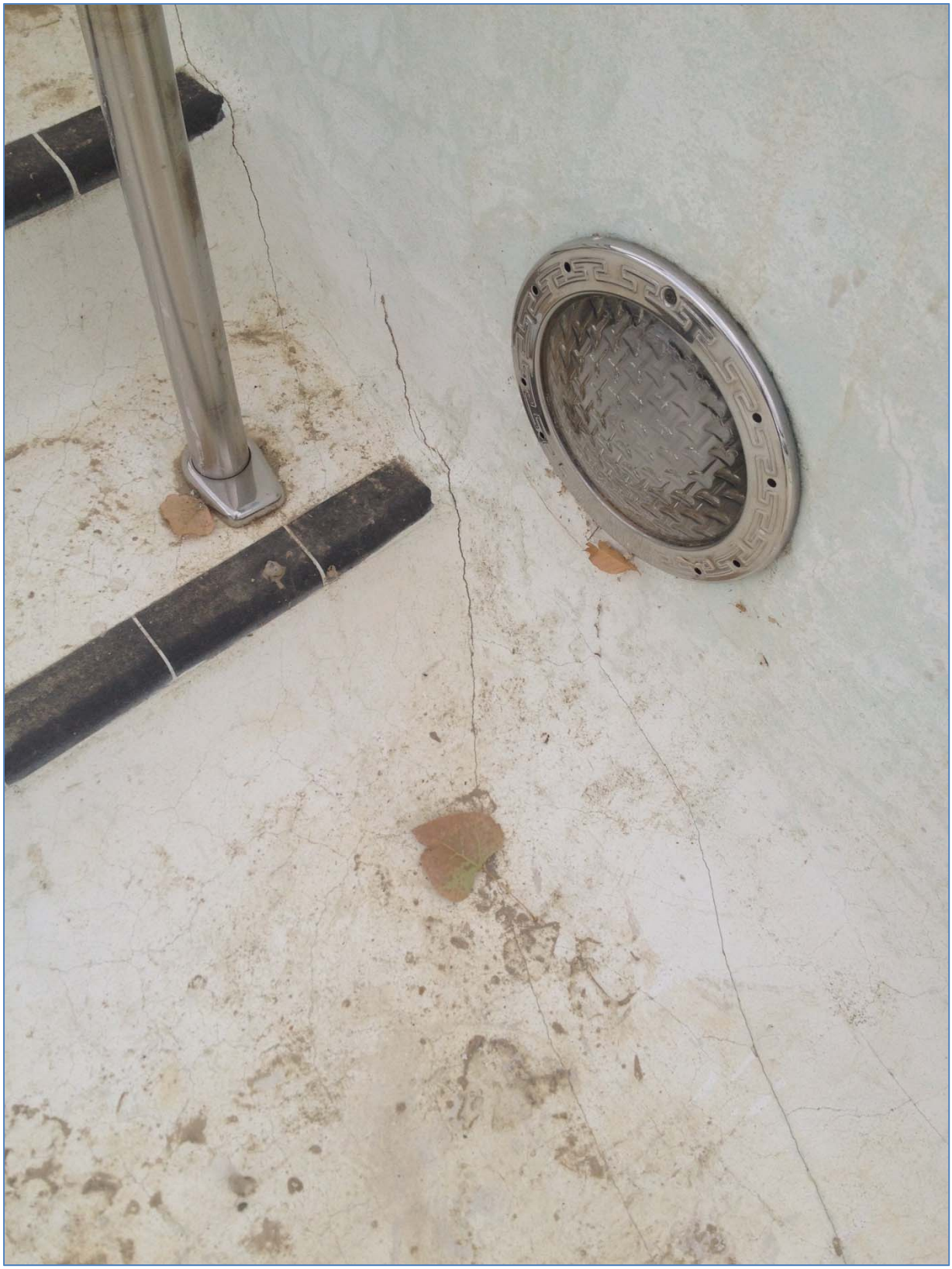


Figure 30: Photograph of cracks in the swimming pool wall over the steps in the shallow end.

Figure 31: Photographs of cracks in the swimming pool steps and nearby pool wall.

Figure 32: Photograph of crack in the swimming pool floor.

Figure 33: Photograph of a 0.005-inch-(0.005”)-thick feeler gauge in a crack in the swimming pool floor.

Figure 34: Photograph of a 0.025-inch-thick feeler gauge (nearly 1/32”) in cracks in the swimming pool floor and steps.

24. We measured the water depth at the bottom of the 12-inch (12”) PVC sounding tube in the deep end of the swimming pool and found it to be approximately a half-inch (1/2”) deep (See Figures 35, 36).

Figure 35: Photograph of the sounding tube.

Figure 36: Photograph of the interior of the sounding tube.

25. I pulled one of the concrete cores in the deep end of the swimming pool and reached in and pulled up a handful of the material that was under the swimming pool. At that spot, there was three-eighths-inch (3/8") pea gravel. It was wet.

26. As far as we are aware, no leak detection testing has been conducted on the swimming pool circulation piping.

27. As noted in previous reports, the deck drainage system consisting of the deck slot drain and slot drain clean out (the slot drain clean out is also called the cleanout, the cleanout box, the deck drainage cleanout box, the collection inlet box, and the cleanout and drainage inlet box) were identified as a likely source of water leakage to the subsurface (See Figures 8, 9, 13, 15, 18).

28. It appears that, for whatever reason, the contractor did not follow the design drawings with regard to the deck drainage system (the deck slot drain and slot drain clean out). Drawing SP-15 Detail 3 required Schedule 40 PVC pipe (which is always colored white) for the deck slot drain (See Figure 37). The type of piping used for the deck slot drain was not the required Schedule 40 PVC, but some kind of green thin-walled piping that is much thinner than Schedule 40 PVC (See Figures 38, 39).

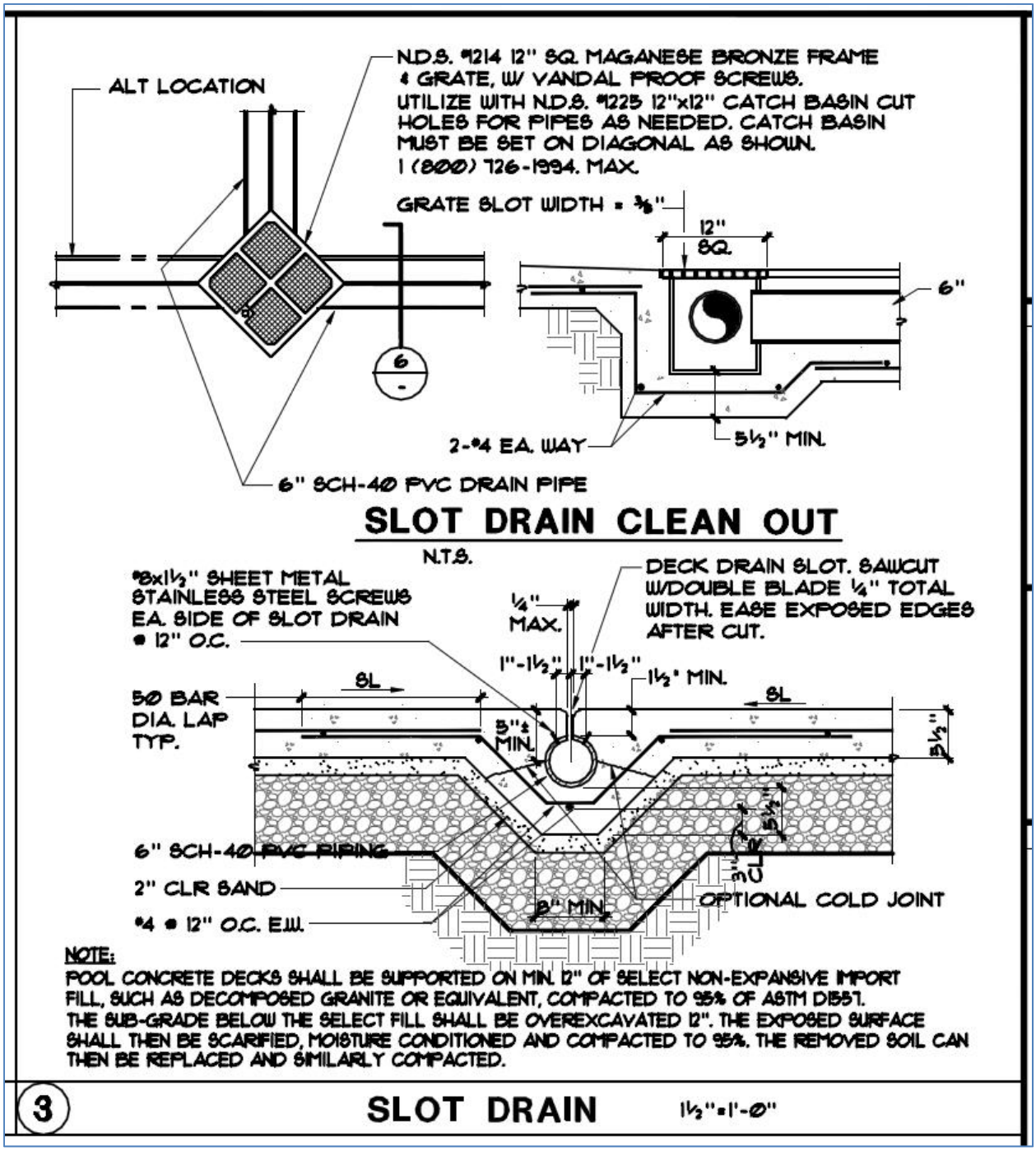


Figure 37: Drawing SP-15 Detail 3 detailing the requirements of the slot drain and slot drain clean out (the slot drain clean out is also called the cleanout, the cleanout box, the deck drainage cleanout box, the collection inlet box, and the cleanout and drainage inlet box). The slot drain pipes were called out to be Schedule 40 PVC twice in this Detail. The slot drain clean out was to have 5.5 inches (5-1/2") of concrete and reinforcing steel or rebar around it. The Note also requires that the pool concrete decks be supported on a minimum of 12 inches (12") of select non-expansive import fill such as decomposed granite or equivalent.

Figure 38: The green piping shown here was used for the deck slot drain. This is not Schedule 40 PVC (as required by Drawing SP-15 Detail 3; See Figure 37), but is a type of thin-walled piping that is much thinner than Schedule 40 PVC. The boxlike cavity is the place where the slot drain clean out was installed (See Figures 37, 39). Note that the required 5.5 inches (5-1/2") of concrete underneath the slot drain clean out does not exist (See Figure 37). Also note that the required reinforcing steel (i.e., rebar) around the slot drain clean out was not put in (See Figure 37). Additionally, the strength of the concrete structure around the slot drain clean out was compromised by the electrical conduit that was emplaced where there should have only been concrete and rebar (See Figures 37, 39).

29. It appears that, for whatever reason, the contractor also did not follow the design drawings with regard to the slot drain clean out in that:

    a. 5.5 inches (5-1/2") of concrete was not emplaced under the slot drain clean out as required by Drawing SP-15 Detail 3 (See Figures 37-39).

b. Drawing SP-15 Detail 3 required that reinforcing steel/rebar be placed around the slot drain clean out; there was none placed where the drawing required (See Figures 37-39).

c. Electrical conduit was run through the space that should have had, per Drawing SP-15 Detail 3, concrete and rebar (See Figures 37-39).

Figure 39: The green piping shown here was used for the deck slot drain. This is not Schedule 40 PVC (as required by Drawing SP-15 Detail 3; See Figure 37), but is a type of thin-walled piping that is much thinner than Schedule 40 PVC. The boxlike cavity is the place where the slot drain clean out was installed (See Figures 37, 38). The box with holes lying on the ground was the catch basin for the slot drain clean out (See Figure 37). Note that the required 5.5 inches (5-1/2") of concrete underneath the slot drain clean out does not exist (See Figure 37). Also note that the required reinforcing steel (i.e., rebar) around the slot drain clean out was not put in (See Figure 37). Additionally, the strength of the concrete structure around the cleanout box was compromised by the electrical conduit that was emplaced where there should have only been concrete and rebar (See Figure 37, 38).

30. It also appears that, for whatever reason, the contractor did not follow the design drawings with regard to the deck drainage system (the deck slot drain and slot drain clean out). Drawing SP-15 Detail 3 required that the pool concrete decks be supported on a minimum of 12 inches (12”) of select non-expansive import fill such as decomposed granite or equivalent. As shown below, the fill used for that location was likely derived from materials excavated on-site, which was not equivalent to the required fill (See Figures 37, 40).

Artificial Fill (af)

A cursory review of a preconstruction topographic map and grading plan for the site suggests that the grade of the northwest portion of the site was raised approximately 2 to 3 feet. Fill used for site grading (and encountered in DH-02) is similar to clayey alluvium encountered in the upper 10 to 15 feet and was likely derived from materials excavated on-site for the wading and swimming pools. Alluvial deposits are present below the surficial fill materials.

Figure 40: Excerpt from Fugro Consultants April 2013 (Revised May 2013) Report Page 3. Note in this excerpt that the “grade of the northwest portion of the site was raised approximately 2 to 3 feet.” The northwest portion of the site is the area marked in Fugro Consultants’ Plate 2 as being depressed (See Figure 11).

31. During my site inspection, I took 19 photographs of the swimming pool, the wading pool, the deck, and the building and Managing Principal Greg Cannon took 14 photographs.

IV.Professional Opinions and Recommendations

32. It is my professional opinion, because of the above, that the slot drain clean out (also called the cleanout, the cleanout box, the deck drainage cleanout box, the collection inlet box, and the cleanout and drainage inlet box) was the source of the initial leaks and differential settlement for an unknown period of time. The wading pool initially began to suffer differential settlement because of the slot drain clean out's close proximity to the wading pool.

33. It is my professional opinion that the sequence of events that occurred in the 6-10 hours previously mentioned on October 14, 2012 is as follows: The initial differential settlement of the wading pool had put stress on the circulation pipe joints, which ultimately failed under the stress and the circulation pipes were pulled out of their fittings (the pipe joints that failed were part of the circulation system that returned water to the wading pool). The wading pool is operated with continually circulating water and an automatic fill device (SP-10, Detail 1) which automatically adds water to the wading pool if it is below a set level. After the circulation pipes suffered catastrophic failure, the circulated water was lost into the ground instead of being returned to the wading pool. When the circulated water failed to return to the wading pool, the automatic fill device activated to pump more water to the wading pool. All of the water that the system continued to attempt to pump to the wading pool was instead pumped into the ground where the separation of pipes from their fittings had created a gap. This continued until the system was turned off.

34. In my professional opinion, I concur with the previous assessments that the differential settlement has made the wading pool unusable and irreparable (See Figures 16, 17).

35. **Per our elevation measurements, the swimming pool has continued to settle since the waterline witness mark was created.** The northwest corner of the swimming pool has continued to settle to its recorded state of 3.5 inches (3-1/2") below the southeast corner (See Figure 26). **It is my professional opinion that the swimming pool will continue to settle further, particularly if it is refilled with water.** Per SP-1, the swimming pool was

designed with a volume of 93,176 gallons of water, which has a weight of 777,088 lbs. As noted above, the swimming pool has continued to settle while it was empty. When the swimming pool is filled with water, it will obviously exacerbate the situation.

36. The 3.5-inch (3-1/2”) differential settlement is too great for the skimmers to operate as designed. If an attempt is made to operate the swimming pool in its current condition (and assuming the swimming pool does not experience further differential settlement), it is barely possible for the water level to be set so that the skimmers can be simultaneously operated, but there is no margin of safety for any changes in the water level (e.g., influx of bathers, rain, etc.).

37. If an attempt is made to operate the swimming pool in its current condition and the skimmer in the northwest corner is operated with the water at its normal operating level, the skimmer in the southeast corner will be dry and suck air which will cause the circulation pump to lose prime and would likely result in damage to the circulation pump.

38. The swimming pool structure has been geologically compromised. Any jacking or localized structural reinforcement will not work as the structural loads will be unevenly distributed through the existing structural shell, resulting in more cracking failures.

39. It is my professional opinion that the circulation piping that goes to and from the swimming pool may have already failed from the stresses caused by the 3.5 inches (3-1/2”) of differential settlement of the northwest corner of the swimming pool. If the swimming pool circulation piping has not yet failed, it continues to be at risk of failure in the future because the differential settlement, the very motion, of the northwest corner of the swimming pool continues to stress the circulation piping and cannot been relieved. The stress will only increase over time as the differential settlement continues to occur.

40. It is my professional opinion that the circulation piping that goes to and from the swimming pool, if it has not already failed, may also fail in the future during pressure cycling from the stresses created by the differential settlement of the swimming pool.

41. It is my professional opinion that the issues shown in the above two paragraphs plus the cracks in the swimming pool at the shallow end and the crack in the pool at the break-in-

slope (See Figure 29) combine to make an extraordinary and unacceptable risk to attempt to save or utilize the existing swimming pool shell.

42. Based on all of the above, it is therefore my professional opinion that the swimming pool is unusable and irreparable.

43. It is my professional opinion and recommendation that both the wading pool and the swimming pool should also be completely removed and replaced under the coordinated guidance of: a qualified geotechnical engineer, a qualified structural engineer, and an aquatic designer.

44. I also recommend that all circulation pipes for the pools should be pressure tested (at 100 psi for one hour) for leaks prior to reconnecting them to the swimming pool and wading pool.

V. Cost Estimates

45. Following are cost estimates for the removal and replacement of the swimming pool and the wading pool.

46. The following cost estimates are based upon:

    a. The same pool contractor removes and replaces both the swimming pool and the wading pool at the same time.
    b. All of the equipment (for both pools) in the Pool Equipment Room is in good operating condition and does not need to be repaired or refurbished.
    c. The above-recommended pressure testing for circulation piping for both pools is included in the cost estimates for the pool piping.

47. The following cost estimates do not include the cost estimates for:

    a. The recommendations of a qualified geotechnical engineer including overexcavation, recompaction with new fill, etc.
    b. New permits from the County of Santa Barbara (e.g., Health Department, Building and Safety, etc.).
    c. New aquatic design documents and specifications including new structural engineering and electrical engineering.
    d. Repair or replacement of circulation piping for either pool underneath the pool building.
    e. Replacement of the pool deck, deck slot drain, and slot drain clean out, which are not part of the pool contractor's scope of work.

Estimated Cost of Swimming Pool Removal and Replacement	Estimated Cost
Top Form	$4,000.00
Demolition	$20,000.00
Grading	$5,000.00
Rebar	$25,000.00
Shotcrete	$45,000.00
Tile and Coping	$20,000.00
Plaster	$21,000.00
Pool Piping	$15,000.00
Deck Anchors	$3,500.00
Electrical	$10,000.00
Temporary Facilities	$2,000.00
Clean-Up	$3,500.00
Supervision	$12,000.00
Travel	$10,000.00
Swimming Pool Subtotal:	**$196,000.00**
Overhead: 10%	$19,600.00
Subtotal	**$215,600.00**
Contingency: 10%	$21,600.00
Subtotal	**$237,2000.00**
Profit: 10%	$23,800.00
Subtotal	**$261,000.00**
Insurance	$2,000.00
Swimming Pool Total Estimated Cost of Removal and Replacement:	**$263,000.00**

Estimated Cost of Wading Pool Removal and Replacement	Estimated Cost
Top Form	$1,500.00
Demolition	$5,000.00
Grading	$3,000.00
Rebar	$5,000.00
Shotcrete	$7,500.00
Tile and Coping	$4,000.00
Plaster	$5,000.00
Pool Piping	$7,500.00
Play Feature	$9,000.00
Electrical	$5,000.00
Temporary Facilities (if done simultaneously with the swimming pool)	$0.00
Clean-Up (if done simultaneously with the swimming pool)	$0.00
Supervision (if done simultaneously with the swimming pool)	$0.00
Travel (if done simultaneously with the swimming pool)	$0.00
Wading Pool Subtotal:	**$52,500.00**
Overhead: 10%	$5,300.00
Subtotal	**$57,800.00**
Contingency: 10%	$5,800.00
Subtotal	**$63,600.00**
Profit: 10%	$6,400.00
Subtotal	**$70,000.00**
Insurance	$500.00
Wading Pool Total Estimated Cost of Removal and Replacement:	**$70,500.00**

I have made all of my above-stated opinions to a reasonable degree of professional certainty based on the information that was available to me.

This Needs Assessment has been based on the above listed discovery materials that were made available to me and that I have reviewed to date. Should additional information become available to me I may add to, modify, or change my opinions stated in this Needs Assessment.

Sincerely,

William N. Rowley, Ph.D., P.E.
President
Rowley International Inc
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APPENDIX 1

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William N. Rowley, Ph.D., P.E., C.S.P.

Curriculum Vitae

MILITARY SERVICE:

Major General United States Air Force Reserve, Retired April 1992

1st Lieutenant (1956-1958) – United States Air Force, Honorable Discharge. Research and Development Officer on classified U-2 Project in Germany.

EXPERIENCE:

Founded Rowley International Inc., a multi-disciplined consulting engineering firm dealing with swimming pool design, hydraulics swimming pool filtration, and solar heating in 1980.

Consulting Engineer for the 1984 Olympic Pool Complex in Los Angeles, California, the solar heating of the 1984 Olympic Pool Complex, and numerous other major pool, filtration and solar projects.

From 1970 to 1980, was in charge of all engineering activities for Fluid Filtration Systems, engaged in world-wide industrial and commercial fluid filtration, and for Swimquip, A Marley Company, the largest manufacturer of residential and commercial swimming pool equipment worldwide ($40 million annually). In these positions responsibilities included all company products from development to manufacturing.

Presently involved with many local, State, and Federal agencies and foreign governments on Codes and Requirements. In 1974, and again in 1977, personally developed and demonstrated tests for suction entrapment which were accepted by the Federal Consumer Product Safety Commission (CPSC) and were used as a Model Code for all 50 states.

Member of original Code Committee that drafted the world's first Solar Code in 1974-1976. This Code is presently promulgated by the International Association of Plumbing and Mechanical Officials (IAPMO). Served on numerous national Plumbing and Swimming Pool Code Committees.

Designed filters, swimming pools, marine fish and mammal areas, and commercial and industrial filtration/water treatment systems world-wide, large and small. A leading filtration mechanical equipment designer.

EDUCATION:

B.E. in Mechanical Engineering,
University of Southern California,
Los Angeles, California. 1955.

Air Force Squadron Officer School,
Air University, Maxwell Air Force Base,
Montgomery, Alabama. 1963.

M.S. in Mechanical Engineering,
University of Southern California,
Los Angeles, California. 1964.

Air Command and Staff College,
Air University, Maxwell Air Force Base,
Montgomery, Alabama. 1971.

National Security Management,
Industrial College of the Armed Forces,
Fort Lesley J. McNair,
Washington, D.C. 1973.

Air War College,
Air University, Maxwell Air Force Base,
Montgomery, Alabama. 1979.

Ph.D., Engineering, Kensington University, Glendale, California. 1979. Kensington University closed its doors in 2003 and is no longer active.

AQUATIC ACCIDENTS:

(Swimming Pools / Spas / Slides / Natural Bodies of Water)

- Diving Accident Reconstruction
- Drowning Accident Reconstruction
- Suction Entrapment
- Pneumatic Filter Separations
- Aquatic Codes / Standards
- Swimming Pool Construction - Standard of Care in the Industry
- CAD Drawings
- REVIT 3-Dimensional Drawings
- Aquatic Operations / Standard of Care in the Industry
- Aquatic Signage
- Aquatic Lighting

BODIES IN MOTION / IMPACT:

- Computerized Trajectory Analysis
- Slips and Falls
- Computer Accident Analysis
- CAD Accident Drawings

BOARD CERTIFICATIONS:

Board-Certified Diplomate in Forensic Engineering Sciences (International Board of Forensic Engineering Sciences)

Board-Certified Diplomate in Forensic Engineering (National Academy of Forensic Engineers)

BOARD OF DIRECTORS:

National Swimming Pool Foundation (NSPF) 1983 - 2010

California Spa & Pool Industry Education Council (SPEC) 1976 – present

COMMITTEES:

Executive Committee, California Spa & Pool Industry Education Council (SPEC) 1976 – present

U.S. Consumer Product Safety Commission's (CPSC) and National Spa & Pool Institute's (NSPI) National Swimming Pool Safety Committee (NSPSC) 1987 - 1997

NSPSC's Steering Committee and Research Sub-Committee 1987 - 1997

National Spa and Pool Institute's (NSPI) Technical Council 1974 - 1981

International Association of Plumbing and Mechanical Officials (IAPMO), Uniform Swimming Pool Code Committee 1974 – 1981

National Sanitation Foundation's (NSF) Standard Number 50 Joint Committee (Circulating System Components for Swimming Pools, Spas or Hot Tubs) 1974 - 1992

Chairman, NSPF Aquatic Safety Compendium Committee 1995 - 2006

PROFESSIONAL MEMBERSHIPS:

Fellow / Life Member, American Society of Mechanical Engineers (ASME)

Fellow, National Academy of Forensic Engineers (NAFE)

Licensed Member, National Society of Professional Engineers (NSPE)

Licensed Member, California Society of Professional Engineers (CSPE)

LIFE MEMBER:

International Eagle Scout Association

The University of Southern California General Alumni Association

PERSONAL:

Birthdate: 16 April 1932

HONORS:

United States Air Force Distinguished Service Medal with one Oak Leaf Cluster.

United States Armed Forces Legion of Merit.

United States Armed Forces Meritorious Service Medal with one Oak Leaf Cluster.

United States Air Force Commendation Medal.

The National Sanitation Foundation (NSF) 1985 *Spes Hominum* (For the Good of Mankind) Award.

California Spa & Pool Service Industry Education Council, Locksin Thompson Memorial Public Service Award. 1998.

Citation Award, "Aquatic Safety", Southern California Public Pool Operators' Association. 1998.

Visiting Distinguished Scholar, Advanced Water Treatment Lecturer, Mapua Institute of Technology, Inturamuros, Manila, Philippines. August 25, 1999.

Honorary Doctor of Engineering, International Academy for Integration of Science and Business-Moscow, Russia. December 27, 2002.

Joseph McCloskey Prize for Outstanding Achievement in the Art and Craft of Watershaping. June 2008.

PATENTS:

23 Patents Total: 13 U.S. Patents, 8 Canadian Patents, 2 Spanish Patents. The technical areas the Patents include are: Pumps, Hydraulics, Filtration, Valves, Packaging, Electrical Isolation and Safety. All of these patents became products manufactured by Swimquip (which was bought by Sta-Rite Industries; Sta-Rite Industries was eventually bought by Pentair Pool Products) that are sold in the United States of America and internationally.

PUBLICATIONS AND REPORTS:

1. A Parametric Analysis of Launch Vehicle Recovery Tradeoffs. 1 November 1963, SSD-TDR-63-315.
2. A Comparative Study of Recoverable Orbital Lifting Body Vehicles with Cryogenic and Storable Propellants, December 1966, SSD-TDR-669 (6520-10) – 5.
3. Swimming Pool Main Outlet Tests, June 6, 1974, Swimquip, Inc.
4. Swimming Pool Main Outlet Tests, June 11, 1974, Swimquip, Inc.
5. Swimming Pool Main Outlet Tests, July 23, 1974, Swimquip, Inc.
6. Swimming Pool Main Outlet Tests (Skimmer in line), August 22, 1974, Swimquip, Inc.
7. Swimming Pool Main Outlet Tests (Adjunct Report), August 22, 1974, Swimquip, Inc.
8. The Mechanics of Hi-Rate Sand Filtration, 29 May 1975, National Swimming Pool Institute.
9. An Analysis of Surface Debris Removal from Swimming Pools, August 1975, National Swimming Pool Institute.
10. Primer on Suction Entrapment in Swimming Pools or Therapeutic Pools, November 3, 1976, Swimquip, Inc.
11. A Parametric Approach to Circulation System Design for Large Commercial Pools, November 1976, National Swimming Pool Institute.
12. Primary Modeling Study of the Productivity of Top Minnows, March 1977, Hawaii Institute of Marine Biology, University of Hawaii, Keneohe, Hawaii.
13. A Parametric Approach to the Filtration of Swimming Pools, May 1977, National Swimming Pool Institute.
14. Main Drain Tests with CPSC, February 2, 1977, Swimquip, Inc.
15. Doctoral Dissertation: The Mechanics of Hi-Rate Sand Filtration, William Nelson Rowley, Kensington University, Ph.D., 1979. Copyright 1979, Rowley, William Nelson L000338 University Microfilm International, 300 Zeeb Road, Ann Arbor, Michigan 48160 or 18 Bedford Row, London WCIR 4EJ, England.
16. Designing Commercial Swimming Pools, Plumbing Engineering, Volume 9, No. 5, September – October 1981.
17. Alcohol and Diving Performance, January 1987, University of California, Los Angeles, Department of Kinesiology. Prepared for the National Swimming Pool Foundation, Grant #W85 1125(A), San Antonio, Texas.
18. A Review of the Literature of the Effects of Alcohol as They Relate to Aquatic Skills Such as Diving Headfirst into Shallow Water, 1989, University of California, Los Angeles, Department of Kinesiology. Prepared for the National Swimming Pool Foundation, Grant #W85 1129, San Antonio, Texas.
19. Aquatic Diving Performance, 1991, University of California, Los Angeles Department of Kinesiology. Prepared for the National Swimming Pool Foundation, Grant #W85 1125(B), San Antonio, Texas.
20. Dual Main Drain Suction Entrapment- Hair Entrapment/Entanglement Test Report, 1997, National Swimming Pool Foundation.
21. Dual Main Drain Atmospheric Vent Line Preliminary Test Protocol, 2002, Florida Pool and Spa Association National Spa and Pool Institute.
22. Dual Main Drain Atmospheric Vent Line: Preliminary Test Report, 2002, Florida Pool and Spa Association National Spa and Pool Institute.
23. "A New Oasis" – Sierra Vista Aquatic Center, WaterShapes Magazine, Volume 4, Number 5, May 2002.
24. "Reasonable Choices: An Expert's Perspective on Suction-Entrapment Issues", WaterShapes Magazine, Volume 6, Number 5, May 2004.
25. "Suction Entrapment", Chapter 7, National Swimming Pool Foundation's Aquatic Safety Compendium, December 2004. (Electronic Format)
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27. "Suction Entrapment", Chapter 7, National Swimming Pool Foundation's Aquatic Safety Compendium, 2006.
28. "Dual Main Drain Suction Entrapment Test Report", International Journal of Aquatic Research and Education, Volume 2, Number 3, August 2008.
29. "High-Rise Performance", WaterShapes Magazine Volume 12, Number 8, November 2010.

EDUCATIONAL INSTITUTION LECTURES:

University of California Los Angeles (UCLA) Extension Course, "Commercial Engineering" X492.5. Los Angeles, California. 1981.

Ornamental Horticulture / School of Agriculture-California State Polytechnic University, Pomona PA 325 Aquatic Facility Management, "Construction of Outdoor & Indoor Swimming Pools". Pomona, California. 1987.

UCLA Extension, "Sports Facility Design and Management". Los Angeles, California. 1988.

Harvard University-Graduate School of Design, "Campus Athletic and Recreational Facilities." Cambridge, Massachusetts. July 14-15, 1994 and July 26-28, 1996

Advanced Water Treatment, Mapua Institute of Technology, Inturamuros, Manila, Philippines. August 25, 1999.

PRESENTATIONS:

Washington Recreation & Park Association (WRPA) Aquatics Sections Maintenance and Design Seminar "A Parametric Design of Circulation Systems for Maximum Energy Savings". Ellensburg, Washington. 1983.

National Aquatics Management School, "Looking Through the Architect's Eyes". Lake Arrowhead, California. 1990.

Environmental Health Association-42nd Annual Educational Symposium - "Suction Entrapment." Long Beach, California, California. April 1993.

Consumer Products Safety Commission Suction Entrapment Briefing, National Spa and Pool Institute. Bethesda, Maryland. 1996.

Southern California Public Pool Operators' Association "Suction Entrapment". Los Angeles, California. 1998.

Riverside County Health Department, "Dangers of Suction Entrapment". Riverside, California. Riverside, California. April 30, 2002.

World Aquatic Health Conference (sponsored by the National Swimming Pool Foundation [NSPF]) "Future Trends In The Aquatic Industry" Colorado Springs, Colorado. November 8, 2010

PROFESSIONAL REGISTRATIONS:

(Active)

California	ME#12864	02/15/63
Florida	PE #17881	11/03/72
Texas	PE #34700	01/20/73
Pennsylvania	PE #19260-E	03/15/73
Arizona	EM #9329	12/14/73
Hawaii	PE #3621	07/18/74
Nevada	PE #4116	04/30/75
California	CR #378	11/23/76
Wisconsin	PE/ME#16990-006	08/15/77
Idaho	ME #4092	04/20/80
Colorado	PE #22523	05/11/84
New York	PE #65284	01/25/89
Oregon	#14831PE	02/27/90
Washington	PE #34252	07/21/97
Utah	PE #346269	09/04/97
South Carolina	PE #20202	01/31/00
Massachusetts	ME #42661	04/20/00
Ohio	PE #65433	01/05/01
Mississippi	PE #19383	09/30/09
Montana	PE #20202	06/01/11

(Inactive)

Georgia	PE #8846	04/02/73
New Mexico	ME #5493	12/07/73
Delaware	PE / ME #5022	040/8/76
Kentucky	PE/ME #10355	07/25/77
Illinois	PE/ME #62-037684	04/06/79
Dist. of Columbia	PE #7538	01/25/80
Indiana	PE / ME #21193	01/04/85
Maryland	PE #19798	04/17/93
Michigan	PE #6201041460	12/07/95
Virginia	PE #0402 038069	12/18/02
Connecticut	PE #25027	06/01/06
U.S. Virgin Islands	PE #1073-E	02/01/10

OTHER REGISTRATIONS, LICENSES, CERTIFICATES:

National Engineering Council Certificate #2969, 9/29/64

General Engineering Contractor (A) California #302451, 2/3/75 (Inactive)

General Plumbing Contractor – C-36 California (Inactive)

General Solar Contractor – C-46 California (Inactive)

General Swimming Pool Contractor – C-53 California (Inactive)

County of Los Angeles Health Department Certified Swimming Pool Service Technician – #T0326, 3/31/83

Certified Safety Professional - #9731, 5/19/90

COMMUNITY ACTIVITIES:

Past President and Member of the Board of Directors of the University of Southern California School of Engineering Alumni Association.

Charter Member of Archimedes Circle, a University of Southern California Engineering Support Group.

Active in the University of Southern California and its various support groups and programs.

AERONAUTICAL ACTIVITIES:

Commercial Pilot: Airplane Single and Multiengine Land, Instrument, Rotorcraft – Helicopter. Certified Flight Instructor (CFI): Airplane Single Engine #1250757 (Licensed Since July 1952).

WESTBERG + WHITE, INC.
ARCHITECTS AND PLANNERS

November 13, 2013

County of Santa Barbara
Capital Projects division
1105 Santa Barbara Street
Santa Barbara, Ca 93101

Attention: Mr. Andrew Tranovich

Subject: **Pre-Design Assessment Report**
For the New Cuyama Pool Incident Reconstruction Project
290 Wasioja Street, New Cuyama, Ca 93254
County of SB – P.O. #CN15986
County of SB Project No. 8736 NCPI
W+W Project No. 13032

Dear Mr. Tranovich,

This Pre-Design Assessment Report is provided in accordance with the Professional Services Agreement dated October 10, 2013 between Westberg + White, Inc. (WW) and the County of Santa Barbara. It includes and references a separate attached Structural Investigation & Evaluation Report by W+W's structural engineer, Michael Parolini of the Smith Structural Group, LLP.

The County's New Cuyama Aquatics Facility is located in New Cuyama, California. An aerial vicinity view showing the site prior to construction is located on page 2 of the structural engineer's report. The following deliverables are provided:

1. A summary of observations and findings, resulting from site visits by Westberg + White and by Michael Parolini and from a review of the following previous reports and documents which are referenced in this Assessment Report by the acronym assigned to each reference below:

WW-MM01	Meeting Minutes by Westberg + White, of initial site visit with Michael Parolini on 10-16-2013.
CSB-DRS	Draft Reconstruction Scope of Work by Andrew Tranovich, County of Santa Barbara (CSB) dated July 12, 2013.
GSI-SR	Original Soils Report by GSI Soils Inc. (GSI), project 7-4661, dated 10-10-2007
GSI-CR	GSI Construction Phase Reports, including:

- Daily Field Reports (47 pages, dated 12-10-2008 through 7-24-2009

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- Masonry Inspection Report (1p) with 3 photos, dated 3-3-2009
- Compression Tests Reports (26p), dated 1-28-2009 through 7-24-2009

FCI-EHP Evaluation of Hydro-consolidation Potential by Furgo Consultants, Inc. (FCI), dated 5-28-2013 (revised)
FCI-PCC Proposal letter for Concrete Coring by FCI, dated 6-28-2013
FCI-GDR Geotechnical Data Report by FCI, dated 9-25-2013
AC-FRD Final Revised Drawings of the Cuyama Aquatics Complex project, Co of SB Project No. 8656) by The Austin Company (AC), dated 01-052010 (52 sheets)
ADG-PCE Preliminary Opinion of Probably Cost Estimate by Aquatic Design Group (ADG), dated 7-3-2013.

2. An assessment of needed repairs and recommendations for re-building of the original design, including descriptions of any observed weaknesses that could or should be addressed at the discretion of the County.
3. An updated Project Schedule
4. An updated Cost Estimate

SUMMARY OF OBSERVATONS AND FINDINGS

As stated in reference CSB-DRS:

> *"Around October 15th, 2012, the New Cuyama Aquatics Facility experienced a soils collapse event which caused major damage to the wading pool and deck, minor damage to the building, and minor damage to the large pool. Initial investigations have revealed soils with hydro collapse potential. With this knowledge, and the knowledge of the forthcoming additional soils work, we are tasked with reconstruction of the facility to previous functionality."*

The above referenced damage was observed on site, is noted in Fig.1 and Photos No.1 through No.8 attached and is further described as follows:

1. The wading pool and its related systems have suffered major settlement and cracking damage sufficient to warrant replacement of the pool and piping.
2. The N and W portions of the concrete deck areas and related deck drainage systems have suffered major settlement, cracking and demolition sufficient to warrant replacement of the deck, damaged drainage system, piping and sub-grade.
3. The NE corner of the masonry building has been seriously undermined and has settled producing cracking in walls and floor slabs sufficient to warrant its repair by pressure grouting, leveling and stabilization of its sub-grade.
4. The NW corner and quadrant of the large pool has settled approximately 1" and significant differential settlement cracks were observed in the pool bottom, side walls, steps and coping, sufficient to warrant its repair by concrete buttressed underpinning, stabilization of its sub-grade. partial leveling of its bond beam NW quadrant bond beam and repair of cracks, plaster finish, tile and copings

In the referenced FCI-EHP report, Fugro Consultants, Inc. outlined the likely sequence of events leading up to and following the observed settlements as follows:

1. *"…the deck drainage cleanout box between the bathroom facility and the wading pool may have been leaking slowly around the outlet pipe connection at the bottom of the cleanout box. Localized settlements caused by this introduced moisture likely caused the outlet pipe to pull out of the casing and become entirely exposed to the subsurface."*

2. *"Once exposed, the deck drainage system was allowed to leak more freely into the subsurface and the wetted area began to expand at an increased rate. This initial settlement was likely bridged by the overlying deck slab and therefore went unnoticed."*

3. *"Nearby wading pool recirculation pipes then may have been overstressed by differential settlements related to the hydro-consolidation at the deck drainage cleanout box. Eventually, the pipes separated at a 45 degree elbow joint 5-10 feet from the cleanout box and the wading pool was allowed to drain into the soils below the hardscape. This large release of water likely inundated the subsurface materials in the vicinity of the deck drainage system and broken recirculation pipes."*

4. *"Water from the broken recirculation pipes is believed to have flowed into the exposed cleanout box drainpipe and out to the bio-swale adjacent to Wasioja/Esquela Street. The observed silt deposits at the bio-swale were likely eroded due to piping between the broken pipes and the exposed drain pipe and then re-deposited at that location."*

   "We understand that most or all of the observed settlement occurred over a period of approximately 6-10 hours."

Based on site observations noted in reference WW-MM01 and our review of the other documents referenced above, we generally support the Fugro sequence of events and make the following additional observations regarding observed settlements and existing conditions within and surrounding the New Cuyama Aquatics Complex:

1. The original soils report GSI-SR did not mention the hydro-consolidation potential of the on-site soils and did not call for pre-consolidation of the soils other than compaction. It permitted over-excavated on-site soil material to be reused as structural fill, thus relying upon the impermeability of decks, pools, drainage systems, pressure piping systems and joint materials to prevent water intrusion and potential hydro-consolidation of the compacted construction pad. When these systems failed to prevent leakage, the underlying hydro-consolidation potential was realized and in our opinion precipitated the collapse event. To the extent that these soils remain in place after reconstruction, there will always be a possibility of water intrusion from a pressure line leak or some unanticipated source and therefore, the possibility of another settlement or collapse event.

2. The area between the NE corner of the restroom building, the large pool and the wading pool was subjected to more frequent wetting from the exterior showers (Photo No.9) and from foot traffic between the pool steps, the restrooms, the showers and the drinking fountains, which would have accelerated any localized settlement due to slow leakage through the deck, expansion joints or deck drains.

3. Landscape irrigation system water may have contributed to hydro-consolidation in some areas. Wet subsoil was noted in open trenches adjacent to fencing at

the wading pool area and along the west side of the masonry building (Photos No. 10 and No.11). In general and especially with the soil conditions present on site it is undesirable to have irrigation next to the structures or on perimeter slopes of the earthen building pad. These areas should relatively impermeable surfaces and have positive drainage away from the structures.

4. Four additional components of the pool deck seal and drainage system may have produced slow unnoticed leaks into the subsurface soils and generated localized hydro-consolidation.

    a. Slot drain detail 3/SP-15 in reference AC-FRD, is not well sealed against leakage and water may have leaked out between the concrete and the outer surface of the PVC drain pipe in part due to the expansion index differential of the materials and in part due to the 2-way saw-cutting of the deck and pipe below. It may also have leaked through the rough surfaces of the "optional cold joints" within the underlying slab (Photo No.12).
    b. The approximately 1-1/8 inch deep saw-cut deck control joints installed per detail 2B/SP-15 in reference AC-FRD, have not been "sealed with sealant" as called for by the detail and by reference GSI-SR. This may have contributed to slow leakage as normal cracking occurred in the decking (Photo No.13). Any existing control joints to remain should be cleaned out and sealed.
    c. Per detail 2A/SP-15 in reference AC-FRD, and as noted in the structural report, the deck was not doweled to the building perimeter. As settlement occurred, cracks may have opened up that created slow leaks, especially in the area of the exterior shower (Photo No.9). As part of the deck reconstruction, the deck area adjacent to the showers should be attached to the building and isolated by expansion joints from the rest of the decking.
    d. In accordance with the swimming pool deck plan on sheet DP-1 in reference AC-FRD, most of the perimeter of the deck area is surface drained to the edge of pavement, spilling in to surrounding landscaped areas. This has led to some observable erosion adjacent to the deck edge and to calcified water chemical deposits on the surrounding ground surfaces (Photo No.14). At the northeast side of the fenced enclosure, the deposits have run into the adjacent park area. This may have contributed to moisture intrusion below the deck edges (Photo No. 21). It is also improper from a pollution standpoint to drain chlorinated pool water directly to grade without de-chlorination. As part of the reconstruction design, perimeter drains should be added to collect the splash water and deliver it to a chlorination filter or to the sanitary sewer.

5. Reference GSI-SR included the following recommendations in paragraph 5.2, 5), on page 5, with respect to the large pool:

    "5) To reduce the potential for differential settlements and provide a drainage layer we recommend the pool be located on a minimum of (2) feet of free-draining ¾-inch clean crushed gravel. Prior to placement of the gravels a layer of suitable geofabric (Mirafi HP270 or equivalent) should be placed. A sump and pump should also be installed. A drainage system should also be located around the sides of the pool. This drainage system would be connected to the gravel section below the pool and to the sump and pump. The final drainage system should be designed by the project civil engineer."

The final drawings, reference AC-FRD, do not show such a drainage system or sump or pump and none were observed on site.

Reference FCI-GDR also notes that 18 inches of gravel was encountered below the large pool rather than 24 inches and does not mention observation of a geofabric layer. The 10 foot depth drill hole logs indicate moist soil was encountered despite the fact that the water table is approximately 49 feet below grade and the site has experienced a prolonged drought condition. Some perched water was also noted in the sub-grade. The source of sub-grade water and moisture is unknown but it could relate to adjacent landscape irrigation.

The large pool section at the top of sheet SP-4 in reference AC-FRD does show a 4 inch fabric wrapped perforated drainage pipe below the low end of the pool that is connected to a 12-inch 'sounding tube' that was observed on site. This may have been installed in lieu of the recommended sub-drainage system, sump and pump. Such a system would rely on frequent observation to determine if water and possible leaks were present and to decide if pumping out was required. No standing water was observed in the sounding tube (Photo No. 16).

6. The following additional observations are made concerning the condition of the large pool:

   a. Reference FCI-GDR also notes that it would be beneficial to perform a manometer survey of the bottom of the pool bottom slab and of the perimeter deck tiling (*and coping*) to determine whether or not the pool has been displaced due to hydro-consolidation. We suggest that a similar survey should be done to determine the degree and extent to which the masonry building has settled at its NE corner.
   b. The main pool drain inlets at the low end of the pool have standing water (Photo No.15). No drainage outlet other than the pump suction line is provided and it is assumed the water is trapped water resulting from the pump shut off. These will need to be cleaned and examined for any deficiencies during reconstruction.
   c. A large number of cracks and a few areas of coping separation were observed at the large pool (Refer to Photos No. 17 - 19).
      - Diagonal and 90-degree trans-pool cracking patterns emanating from the E side of the steps indicate settlement of the entire NW corner of the shallow portion of the pool (Photo No. 17).
      - 90-degree trans-pool cracking parallel and proximate to the pool bottom slope-break lines indicates possible differential settlement of portions of the pool bottom (Photo No. 18).
      - Spider-like cracking associated with the pool bottom water inlets may indicate insufficient reinforcement of the areas around penetrations, or expansion and contraction cracking along stress lines created by the inlet pipe slab penetrations, also possibly related to direct sun on the empty pool bottom (Photo No. 19).
   d. Numerous ameba-like eroded patches are present on the surface of the one inch thick plaster pool lining, possibly due to chemical reactions occurring in standing water puddles following empting of the pool (Photo No. 20).

7. The following observations are made concerning the condition of the masonry building:

    a. The most serious condition occurs at the NE corner of the building in the area of the Men's Restroom and exterior shower where the sub-grade has washed out creating large voids below the slab below the Men's restroom area and the building corner has settled (Photos No. 4 through 7). Structural cracking has occurred in the concrete slab and masonry walls. The adjacent concrete deck has settled and pulled away.
    b. Although no voids were discovered in the borings of reference FCI-GDR, there are spider-like cracking patterns surrounding the center floor drain in the Women's Restroom (Photo No.24) that are similar to those in the Men's Restroom (Photo No. 23) suggesting that hydro-consolidation and slab settlement may have occurred there as well. To a lesser degree, similar cracks were observed near one central floor drain in the Pool Equipment Room. It is unclear if these floor drain associated cracks relate to leak caused hydro-consolidation resulting in settlement or to insufficient reinforcement of the slab in the area of the penetrations.
    c. The slab reinforcement called for on the final drawings, reference AC-FRD, is #3 at 16 inches on center per the Soils Report, reference GSI-SR. This is minimal reinforcement, considering the hydro-consolidation potential of the sub-grade structural fill and the drawings do not indicate any additional reinforcing at penetrations such as floor drains.

8. The following observations are made concerning the condition of landscaped areas, fencing at the perimeter of the facility and miscellaneous site conditions:

    a. Landscape irrigation is causing wetting of the soils at the westerly and northerly perimeter of the facility. Any wetting is detrimental to the stability of the earthen pad, especially at or adjacent to slopes.
        - This has and is continuing to cause soil and sidewalk movement due to hydro-consolidation along the western and northern perimeter of the masonry building.
        - Irrigation of the planter beds at the westerly and southerly sides of the masonry building may contribute to hydro-consolidation below the building perimeter footings. This is not observable at this time.
        - Irrigation has the potential to contribute to hydro-consolidation of sub-soils at the deck perimeter and below fencing, resulting in erosion and possible localized settlement at the deck edge.
    b. Drainage of pool water over the deck edge, and the resulting calcified chemical deposits may damage the landscape, erode the ground surface at the deck edge and contribute pollutants to the storm water run-off. Generally, such water should be directed into the sanitary sewer or filtered to remove chlorination prior to discharge.
    c. Portions of the fencing along the northwesterly and northwesterly perimeter have been partially damaged by the soils collapse event.
    d. Core holes from recent investigations in the large pool should be sealed and made water tight as part of the repair and refinishing work.
    e. New Cuyama residents provided anecdotal information that the municipal water supply contains particulate matter that may enter and clog the plumbing

system including the pool water circulation system, lavatory faucets and drinking fountains.

f. A large accumulation of rodent droppings, assumed to be bat droppings, was observed to have collected in the drinking fountain alcove at the restrooms entry area. No resident bats were observed.

ASSESSMENT COMMENTS AND REPAIR RECOMMENDATIONS

Prior to completion of design details and initiation of the Construction Document Phase of the work, we recommend completion of the following services:

1. As noted in reference FCI-GDR, we recommend that the County obtain a manometer survey of the large pool bottom slab and perimeter deck tiling to determine the degree to which the pool has been displaced or subjected to differential settlement by hydro-consolidation of underlying soils. It is also our recommendation that this survey be expanded to encompass the masonry building and the sidewalks on its N and W sides. This is needed in order to establish grades for building leveling, deck re-paving and drainage and for the leveling of the copings and bond beam in the NE quadrant of the large pool. The scope would be established in consultation with Fugro Consultants Inc. and they may be able to perform the service.

2. As touched on in reference FCI-PCC, we recommend that Fugro be retained by the County to review and comment on the completed Pre-design Report recommendations, undertake additional corings, borings and testing as they deem necessary following consultation with the WW team, to prepare a reconstruction soils report that would include review of the recommendations of this Pre-design Report, recommendation of alternative remedial repair strategies if appropriate. It would also provide the necessary engineering design parameters for use by the structural engineer in the design of reconstruction details. Their scope of work should also include review of the 50% construction documents and construction phase site observations to assure consistency with the report's recommendations as the geotechnical engineer of record for the reconstruction work. To support their construction phase work, the County would also retain a testing lab for construction phase testing in accordance with the construction documents.

3. We recommend the inclusion of an aquatics facility design firm, other than ADG, on the WW reconstruction team. This additional consultant would also review and comment on these Pre-design Report recommendations with respect to the establishing the scope of pool re-commissioning requirements and with particular emphasis on the operational and long range feasibility of stabilizing and operating the large pool in its present out-of-level condition rather than attempting to level it or demolishing and replacing it.

The following recommended repairs are presented in three categories for consideration by the County. Design and preparation of construction documents for execution of the work will be provided by the WW led reconstruction design team. However, per the general scope of work established by the County, the existing design will be utilized,

except where infeasible or where improvements are justified and approved by the County.

Repairs directly related to the soil collapse event:

1. Demolition and Site Preparation:

    a. Note that the contractor shall be responsible for job safety, including perimeter fencing pedestrian protection, worker safety, shoring design and placement and protection of all existing construction to remain.
    b. Demolish and remove all existing damaged construction within the existing pool enclosure fencing, including stockpiled materials, collapsed decking and damaged portions of the large pool, including out-of-level copings and tile. Remove damaged portions of the existing one inch plaster interior pool finish and sandblast the entire surface in preparation for refinishing.
    c. Saw-cut and remove a portion or portions of the existing damaged concrete floor slab within the Men's restroom, including the existing floor drain(s) and drain piping in order to access the sub-grade for foundation repairs and to repair the floor slab.
    d. Remove and salvage all reusable existing improvements and equipment interfering with reconstruction and store for re-installation. At the existing chain link fencing to remain, roll-up the lower portion of the chin link to facilitate preparations for new work.
    e. Remove all loose soils, debris within the areas of reconstruction within the existing building and pool enclosure fencing and over-excavate the exposed sub-surface soils under the observation and direction of the soils engineer until competent material is reached. Scarify and re-compact the exposed material per the reconstruction soils report. Avoid undermining of adjacent structures and provide shoring, designed by a licensed professional engineer as needed.
    f. Remove all hydro-consolidation prone soil below the wading pool and 5 feet beyond the wading pool perimeter. Over-excavate and reinstall the wading pool sub-grade per the recommendations of the reconstruction report.
    g. Remove clear, grub and remove all existing landscaping and irrigation piping within eight feet outside of the existing pool at fence line along the northerly and easterly perimeter of the facility to prepare for installation of new non-irrigated decomposed granite surfacing.
    h. Saw-cut and remove an approximately 12-inch wide strip at the edge of the existing deck perimeter as needed to prepare for installation of new deck edge perimeter drains.

2. Earthwork and Underground Utilities Reconstruction:

    a. The WW reconstruction team shall establish test methods and criteria to examine and test all existing utilities for serviceability and damage. Replace all damaged underground utility lines and conduit to match existing construction, rough-in for new connections and accessories.
    b. Back-fill utility trenches per the reconstruction soils report.

c. Install new large pool concrete buttressed underpinning and sub-grade stabilization.
d. Install new masonry building grade beam and underpinning, pressure grouting, leveling and sub-grade stabilization.
e. Place and compact new structural fill and wading pool gravel base layer to new sub-grade levels per the reconstruction soils report.
f. Place and compact a new concrete deck base layer per the reconstruction report.
g. Excavate for new trench drains around the northerly and westerly sides of the large pool.

3. Large Pool Repairs:

a. Inspect, test and repair all large pool piping, fittings and equipment, including pool area and equipment room equipment and repair or replace as needed.
b. Level the top of the exposed portion of the existing settled bond beam at the NW quadrant and reinstall coping and tile to match existing.
c. Patch and repair all cracks by epoxy injection or other appropriate means.
d. Resurface the entire plaster pool finish and restore all painted graphics.
e. Repair any damaged pool bottom tile.
f. Clean, restore and/or reconstruct all damaged large pool finish surfaces, hardware, accessories and fittings per the original plans, including the repair of cracked copings, cracked tile work graphics, inlets and drains, etc.

4. Wading Pool and Deck Reconstruction:

a. Reconstruct the wading pool bottom and sides consistent with the original plans, except provide additional reinforcing bars around bottom penetrations. Reinstall and/or replace all salvageable wading pool equipment.
b. Repair cracks in the exposed large pool perimeter by epoxy injection.
c. Overlay the new concrete deck base layer, and cover below all slot drain and cleanout box excavations with a waterproof under slab barrier such as the WR Meadows PMPC underslab system (see Fig.2) having all penetrations sealed. The waterproof barrier shall be turned up at the sides of the wading pool, large pool and at existing building footings and sealed per manufacturer's recommendations to form an impervious layer below the new deck areas.
d. Install sub-drainage piping and gravel at the exposed wading pool perimeter. Install perimeter trench drains, such as the factory manufactured HDPE type shown in Fig.6, with stainless steel grates, sealed joints, at the new deck edges. Run the drainage lines to a new sump pump (see example at Fig.7) with discharge to the sanitary sewer – to be designed by the WW team Civil Engineer.
e. Replace existing deck area plastic cleanout and drainage inlet boxes with new factory manufactured HDPE types such as the Zurn products shown in Figs. 4 and 5, with stainless steel grates, sealed joints, and connect to the new storm drain piping.

f. Replace all existing deck area field fabricated slot drains with new water tight manufactured HDPE types, such as the Zurn product shown in Fig.3, with stainless steel grates, sealed joints, and connect to the new cleanout and drainage inlet boxes.
g. Reconstruct the concrete deck areas in general conformance with the original plans except where improvements are needed, such as in drainage patterns, at new slot drains, cleanout boxes and perimeter edge trench drains and where other alternative drainage slopes or details may be shown in the final plans as a result of design team collaboration and County approval.
h. Clean out dust and debris from all of the existing to remain concrete deck saw-cut control joints. Remove all sealant from existing expansion joints. Install new expansion joint and control joint sealant at all expansion joints and control joints.

5. Masonry Building Repairs:

a. Inspect, test and repair all masonry piping, fittings and equipment in the areas affected by the event and/or included in the area of work, including the restrooms and the pool equipment room equipment and repair or replace as needed.
b. Patch and repair all cracks by epoxy injection or other appropriate means.
c. Clean, restore and/or reconstruct all damaged building finish surfaces, hardware accessories and fittings in the area of work per the original plans, including the repair of copings, tile work graphics, plaster finish lining, inlets and drains, etc.

6. Fencing, Landscape and Irrigation System Repairs:

a. In areas adjacent to but outside of the area of the work, on the northerly sides of the large pool and wading pool decking, prepare sub-grade in previously landscaped areas to receive new D.G. surfacing or other relatively impervious surfacing, including a geofabric underlayment and sub-drainage where required to direct water away from the deck and a moisture resistant membrane.
b. Install new D.G. impervious surfacing and new replacement fencing to match and align with existing fencing.
c. Complete installation and restoration of altered landscape and irrigation in areas adjacent to but outside of the area of the work, on the northerly sides of the large pool and wading pool decking.

<u>Repairs indirectly related to the soils collapse event</u>:

1. At the existing masonry building, saw-cut and remove portions of the existing concrete floor slabs at the Women's Restroom and in the Pool Equipment Room surrounding 2 existing floor drains showing spider-like cracking patterns. Replace the floor drains and related drainage piping if damaged and replace the slab, including dowels into the remaining slab and increased reinforcement. Clean and repair any damaged finish surfaces, hardware accessories and fittings in the area of work.

2. At the W side of the existing building, remove portions of the existing landscaping and irrigations system next to the building and west of the sidewalk. Remove displaced and settled portions of the existing concrete sidewalks. Clear, grub and level the sub-grade.

3. Prepare sub-grade in previously landscaped areas to receive new D.G. surfacing or new replacement concrete walks, including geofabric underlayment and sub-drainage where required to direct water away from the deck and provide a moisture resistant membrane. Install new D.G. impervious surfacing and new concrete walks.

4. At the perimeter of the existing large pool deck to remain, excavate and install a new trench drain edge detail with membrane below and with connections to the new sump pump.

5. At the large pool deck area on the E end of the pool surrounding the existing sounding tube, remove the existing concrete deck and excavate down to the level of the bottom of the existing sounding tube. Replace the sounding tube with a storm drain pipe extension to the new sump and sump pump. Reinstall the sub-grade and the pool decking to the new reconstruction standards.

6. In connection with the reconstruction, perform a code review to identify any existing non-compliant features that should be addressed as part of the reconstruction which will be governed by the new 2013 CBC and the current versions of other applicable codes.

COMMENTS AND CONCLUSIONS

Pre-Design Cost Estimate

A preliminary Pre-Design Cost Estimate is attached for budgeting purposes. This will be updated at the 50% CD phase to include adjustments resulting from development of the details of the reconstruction design with input from all WW team members, the County and the County's other consultants. The County has assumed responsibility for establishing the "Soft Costs" budget and these amounts will be adjusted following identification of fees for services for remaining phases of the work.

Pre-Design Schedule

A preliminary Pre-Design Project Schedule is attached for planning purposes. This will be updated at the 50% CD phase to include adjustments resulting from development of the details of the reconstruction design with input from all WW team members, the County and the County's other consultants. It is the County's intent to have the reconstructed facility ready for occupancy by January 1, 2015.

Qualifications and Exclusions

This Report is based upon observations of existing site conditions and review of the cited written documents. There may be hidden or latent conditions or deficiencies in the previous design by others or resulting from changes made during the original

construction and not documented, that were not apparent to the authors of this report. Additionally, it is known that a majority of the existing earthen pad, containing compacted soils with collapse potential, will remain in place below both the existing construction to remain and reconstructed areas. Therefore no warranty is made that the recommended repairs will preclude the occurrence of settlement or collapse events in the future should water intrusion from whatever source occur.

The intent of the Report's recommendations, as directed by the County is to follow the original design except where an improvement is justified, recommended by the WW team and approved by the County. In its execution of the remaining phases of the work, the WW team assumes no responsibility for remaining original design components or for any underlying, hidden or latent conditions or for work provided by others.

We appreciate the opportunity of working with the County on this important reconstruction project for the New Cuyama Community. We respectfully submit our assessment of the collapse event and our recommended reconstruction strategies for consideration by the County and other participants. Please contact me if you have any questions or additional information is required.

Sincerely.

Don Hertel
Principal Architect C-15710
Santa Maria, CA Office
(805) 346-2991

Enclosures: Fig.1 Site Plan Assessment Field Notes
Figs 2-7 Example Reconstruction Materials and Details
Referenced Photos No. 1 through 24
Pre-Design - Cost Estimate
Pre-Design - Project Schedule
Structural Engineer's Letter-Report, dated November 4, 2013
Meeting No.1 Minutes, Initial Site visit October 16, 2013

Copy: Celeste Manolas, Co of SB
Todd Morrison, Co of SB
Michael Parolini, SE**Fig. 1 Site Plan Assessment Field Notes**

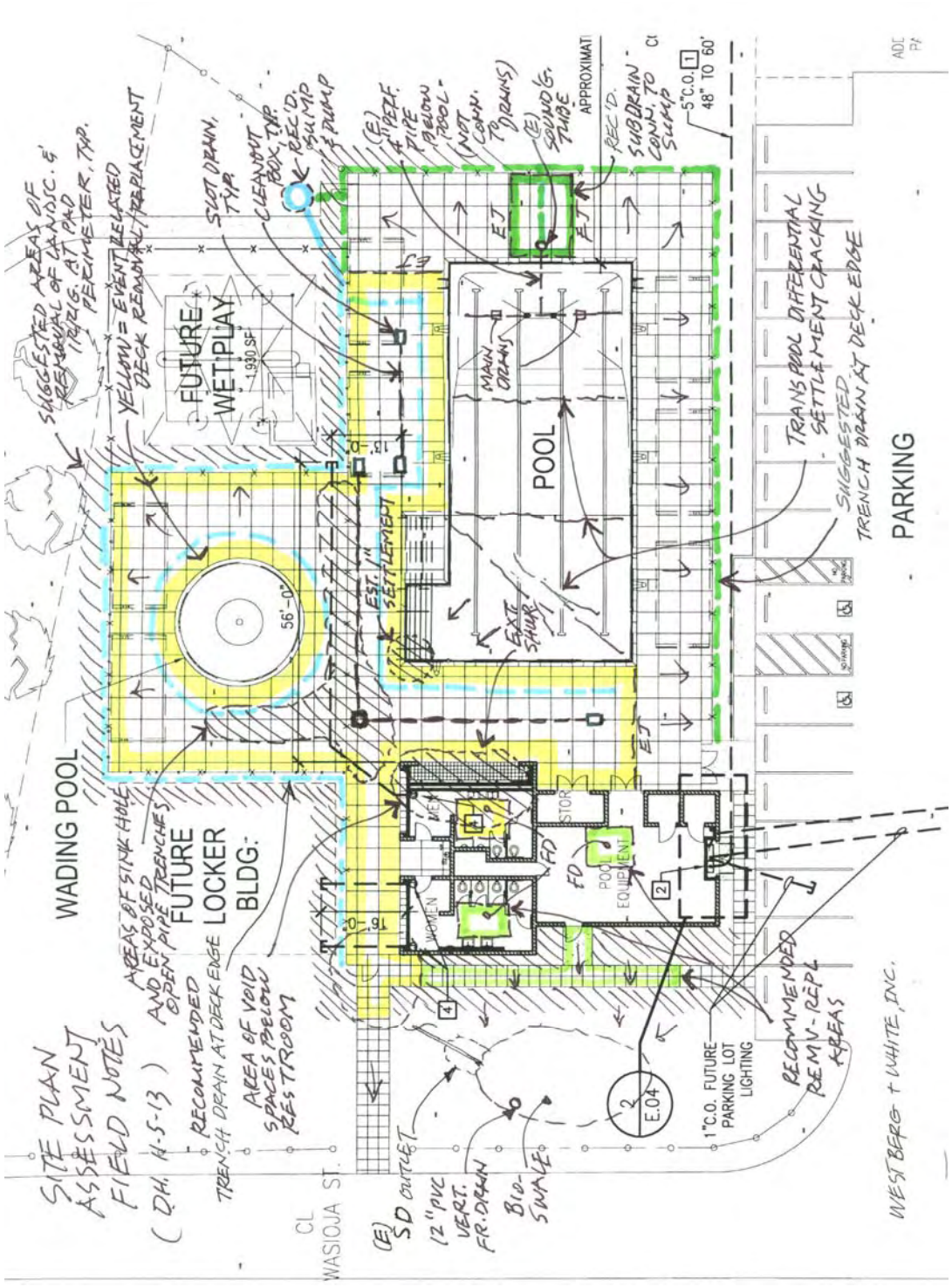

SITE PLAN ASSESSMENT FIELD NOTES
(DH. 11-5-13)
WADING POOL
FUTURE WET PLAY
1,930 SF
FUTURE LOCKER BLDG.
POOL
PARKING
56'-0"
EST. 4" SETTLEMENT
EXIST. SHADE
MAIN DRAIN
SLOT DRAIN, TYP.
CLEANOUT BOX, TYP.
REC'D. SUMP & PUMP
(E) 4" PIPE FROM POOL (NOT CONN. TO DRAINS)
(E) SOUND'G. TUBE
APPROXIMAT
REC'D. SUBDRAIN - CONN. TO SUMP
5"C.O.
48" TO 60'
EJT
SUGGESTED AREAS OF REMOVAL OF CANOSC. & TRIPLE AT PAD PERIMETER, TYP.
YELLOW = EVENT RELATED DECK REMOVAL & REPLACEMENT
AREAS OF SINK HOLE AND EXPOSED OPEN PIPE TRENCHES
RECOMMENDED TRENCH DRAIN AT DECK EDGE
AREA OF VOID SPACES BELOW RESTROOM
WOMEN
MEN
STOR
FD
POOL EQUIPMENT
SUGGESTED TRENCH DRAIN AT DECK EDGE
TRANS POOL DIFFERENTIAL SETTLEMENT CRACKING
1"C.O. FUTURE PARKING LOT LIGHTING
RECOMMENDED REMV.-REPL AREAS
(E) SD OUTLET
12" PVC VERT. FR. DRAIN
BIO-SWALE
CL
WASIOJA ST.
E.04
WESTBERG + WHITE, INC.

Fig. 2 Example Under Slab Waterproofing System – WR Meadows PMPC

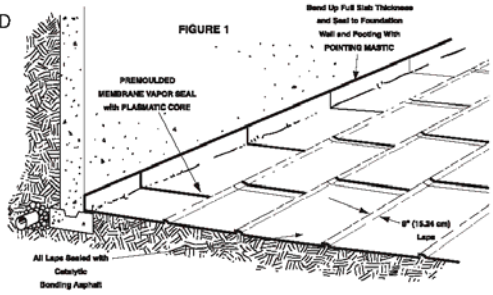
W. R. MEADOWS, SEALTIGHT.

PAGE 3 … NO. 711 … MARCH 2006

HORIZONTAL APPLICATION ... PMPC can be applied directly over tamped grade, because it does not require a gravel bed, a bed of sand and/or "crusher rock" prior to the installation of the floor slab, although these practices are acceptable. If PMPC is to be placed over a large angular fill, see 4.1.4 of ACI 302.1R-96 for recommendations. Material is placed in position, poly side up, by either the "Dutch Lap" method (Figure 1) with laps sealed with Catalytic Bonding Asphalt, or by the "Butt-Joint" method (Figure 2) with joints sealed with PMPC Tape. These methods provide a permanent, monolithic vapor seal, without voids or open seams. If desired, on structural floor slabs of multi-level buildings, sheets may be placed in a bed of hot asphalt for continuous adhesion. Remove plastic film at joints prior to applying Catalytic Bonding Asphalt or PMPC Tape.

THE "DUTCH LAP" METHOD (Figure 1): The "Dutch Lap" method of applying PMPC on or below-grade horizontal areas. After removing the polyfilm at the 6" overlap areas, seal all laps with Catalytic Bonding Asphalt. Pressure roll or "walk-in" all laps to assure complete adhesion.

FIGURE 1



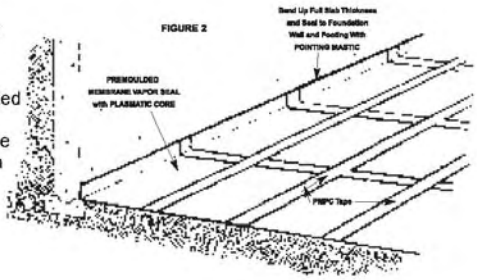
Application Tools


Roofer's Knife


Caulking Gun

THE "BUTT-JOINT" METHOD (Figure 2): The Butt-Joint method of applying PMPC. After the sheets are tightly butted together, remove the polyfilm, center the PMPC Tape over the "Butt-Joints" and roll down with pressure for a positive seal.

FIGURE 2




Roller


Long-Handle Roller

SEALING PROCEDURES

All protrusions through the concrete slab, such as sewer pipes, water pipes and utility inlets, must have a positive seal between the protrusion and the PREMOULDED MEMBRANE. Place a collar of PMPC at least 12" larger than the protrusion around the protrusion. Seal in place with PMPC Tape and point around the protrusion with POINTING MASTIC.

PROTRUSION DETAIL

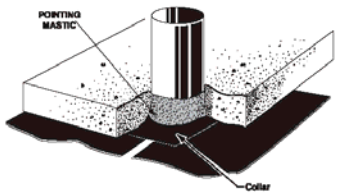


Fig. 3 Example Manufactured Slot Drain system – Zurn Z888 - 4HD (HDPE)

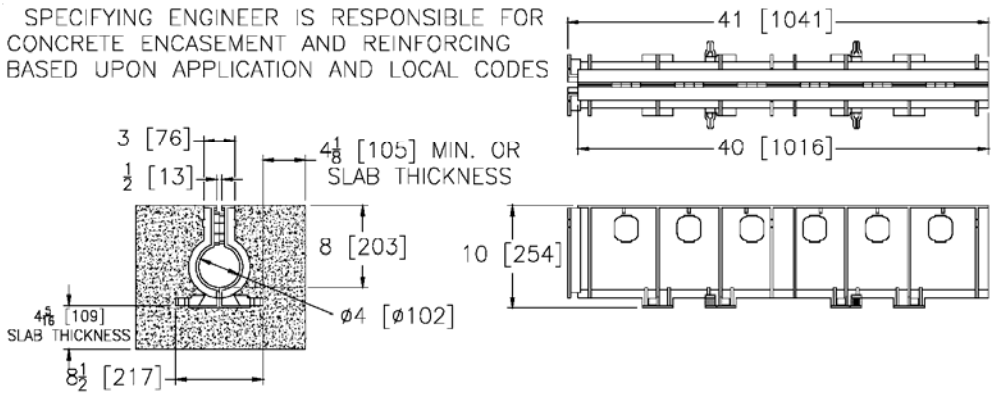
ZURN

Z888-4
SLOTTED DRAINAGE SYSTEM FOR
4 [102] PIPE OR EQUIVALENT

SPECIFICATION SHEET
TAG _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice

SPECIFYING ENGINEER IS RESPONSIBLE FOR CONCRETE ENCASEMENT AND REINFORCING BASED UPON APPLICATION AND LOCAL CODES



ENGINEERING SPECIFICATION: Zurn Z888-4 Slot drain shall be 40 [1016] long, 4 [102] wide, and 8 [204] invert, with 1/2 [13] slot opening (ADA Compliant). Drain shall be made of (HDPE) High Density Polyethylene, and is UV-10 stabilized. Drain shall have rebar clips molded onto bedding feet and/or bedding feet shall be used for positioning and anchoring purposes. Overlap connection shall be interlocked.

PREFIXES

___	Z	High Density Polyethylene Slot Drain with Integral Top Frame*

SUFFIXES (Check/specify appropriate options)

___	-E1	Closed End Cap
___	-E2	2 [51] No-Hub End Outlet
___	-E3	3 [76] No-Hub End Outlet
___	-E4	4 [102] No-Hub End Outlet
___	-U2	2 [51] No-Hub Bottom Outlet
___	-U3	3 [76] No-Hub Bottom Outlet
___	-U4	4 [102] No-Hub Bottom Outlet
___	-RD	Radius Connector
___	-WS25	1/4 [6] Wide Heel-Proof Slots
___	-WS75	3/4 [19] Wide Slots
___	-90	90-Degree Connector

*REGULARLY FURNISHED UNLESS OTHERWISE SPECIFIED

REV. D	DATE: 10/7/10	C.N. NO. 111804
DWG. NO. 64439	PRODUCT NO. Z888-4	

ZURN INDUSTRIES, LLC ♦ SPECIFICATION DRAINAGE OPERATION ♦ 1801 Pittsburgh Ave. ♦ Erie, PA 16514
Phone: 814\455-0921 ♦ Fax: 814\454-7929 ♦ World Wide Web: www.zurn.com
In Canada: ZURN INDUSTRIES LIMITED ♦ 3544 Nashua Drive ♦ Mississauga, Ontario L4V1L2 ♦ Phone: 905\405-8272 Fax: 905\405-1292

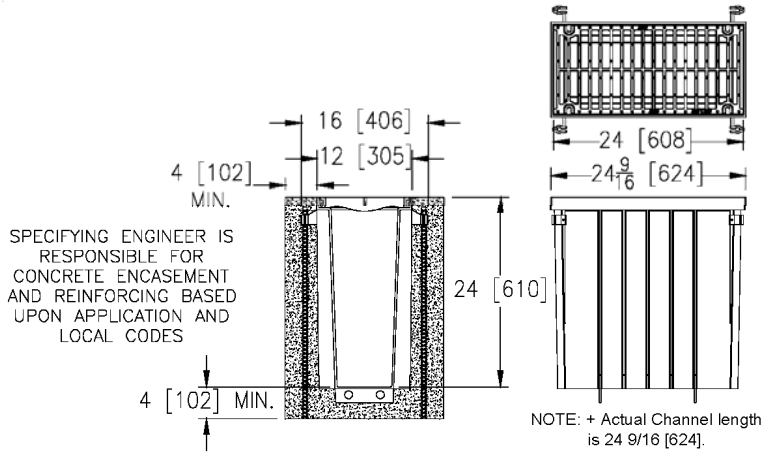
Fig. 4 Example Manufactured Catch Basin – Zurn Z887 – 12 (HDPE)

ZURN

Z887-12
12 [305] WIDE REVEAL x 24-9/16 [624] LONG
CATCH BASIN

SPECIFICATION SHEET
TAG _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



ENGINEERING SPECIFICATION: Zurn Z887-12
Catch Basin shall be 12 [305] wide reveal x 24-9/16 [624] long, and 24 [610] deep. Catch basin shall be made of 0% water absorbent High Density Polyethylene (HDPE). Shall mechanically lock into the concrete surround every 10 [254]. Basin shall weigh less than 14.6 lbs.[6.6 kg]. Catch basin shall have rebar clips standard to secure basin in its final location. Shall be provided with standard DGC grate. Zurn 12 [305] wide reveal Ductile Iron Slotted Grate conforming to ASTM specification A536-84, Grade 80-55-06. Ductile Iron grate is rated class C per the DIN EN1433 top load classifications. Supplied in 24 [608] nominal lengths with 13/16 [21] wide slots, and 1-1/2 [38] bearing depth. Grate has an open area of 80.8sq. in per ft. [171,027 sq. mm per meter].

PREFIX OPTIONS (Check/specify appropriate options)
___ Z 12-inch by 24-inch High Density Polyethylene (HDPE) Catch Basin*

SUFFIX OPTIONS (Check/specify appropriate options)

Adapters
___ -E3/U3 3 [76] No-Hub End/Bottom Outlet Adapter
___ -E4/U4 4 [102] No-Hub End/Bottom Outlet Adapter
___ -E6/U6 6 [152] No-Hub End/Bottom Outlet Adapter
___ -IA Inlet Adapter (Z886)
___ -IA Inlet Adapter (Z882)

Grate Options (Load Classifications are per DIN EN1433)
___ -DGC Ductile Iron Slotted Grate - Class C *
___ -GDC Galvanized Ductile Slotted Grate - Class C
___ -GG Fiberglass Grate - Class A
___ -GHPDE Galvanized Heel-Proof Ductile Slotted Grate - Class E
___ -HPD Heel-Proof Ductile ADA Grate - Class B
___ -HPDE Heel-Proof Ductile Slotted Grate - Class E
___ -RFGC Reinforced Slotted Galvanized Grate - Class C
___ -RPGC Reinforced Perforated Galvanized Grate - Class C
___ -RPGRC Reinforced Perforated Galvanized Reverse Punch Grate - Class C
___ -RFSC Reinforced Slotted Stainless Steel Grate - Class C
___ -RPSC Reinforced Perforated Stainless Steel Grate - Class C
___ -RPSRC Reinforced Perforated Stainless Steel Reverse Punch Grate - Class C
___ -SBG-L Stainless Steel Bar Grate - Class C

Miscellaneous Options
___ -CBF Black Acid Resistant Coated Frame
___ -GFA Galvanized Extra-Heavy Duty Frame Assy. w/ Studs
___ -HD Extra-Heavy-Duty Frame Assembly w/ Anchor Studs
___ -SF Type 304 Stainless Steel Top Frame
___ -Y Sediment Bucket

MADE in the U.S.A. (Load Classifications are per DIN EN1433)
___ -ADA-USA Meets Americans with Disabilities Act Requirements - Class C
___ -DGC-USA Ductile Iron Slotted Grate - Class C
___ -FG Fabricated Galvanized Steel Slotted Grate - Class A
___ -FS Fabricated Stainless Steel Slotted Grate - Class A
___ -GADA-USA Galvanized Ductile ADA Slotted Grate - Class C
___ -GDC-USA Galvanized Ductile Slotted Grate - Class C
___ -GHPDE-USA Galvanized Ductile Slotted Grate - Class E
___ -HPDE-USA Heel-Proof Ductile Slotted Grate - Class E
___ -PG Perforated Galvanized Steel ADA Grate - Class A
___ -PS Perforated Stainless Steel ADA Grate - Class A
___ -RFG-USA Reinforced Galvanized Steel Slotted Grate - Class B
___ -RFS-USA Reinforced Stainless Steel Slotted Grate - Class B
___ -RPG-USA Reinforced Galvanized Perforated ADA Grate - Class B
___ -RPGR Reinforced Galvanized Perforated Reverse Punch Anti-Slip ADA Grate - Class B
___ -RPS-USA Reinforced Stainless Steel Perforated ADA Grate - Class B
___ -RPSR Reinforced Stainless Steel Perforated Reverse Punch Anti-Slip ADA Grate - Class B

*REGULARLY FURNISHED UNLESS OTHERWISE SPECIFIED

REV. M DATE: 5/10/12 C.N. NO. 124288
PROD./DWG. NO. Z887-12

ZURN INDUSTRIES, LLC ♦ SPECIFICATION DRAINAGE OPERATION ♦ 1801 Pittsburgh Ave. ♦ Erie, PA 16514
Phone: 814\455-0921 ♦ Fax: 814\454-7929 ♦ World Wide Web: www.zurn.com
In Canada: ZURN INDUSTRIES LIMITED ♦ 3544 Nashua Drive ♦ Mississauga, Ontario L4V1L2 ♦ Phone: 905\405-8272 Fax: 905\405-1292

Fig. 5 Example Manufactured Catch Basin – Zurn Z887 – 24HD (HDPE)

ZURN

Z887-24-HD

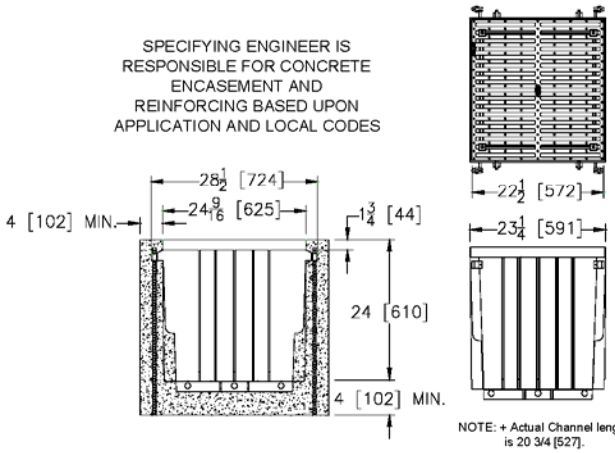
23-1/4 [591] WIDE REVEAL x 24-5/8 [625] LONG
CATCH BASIN WITH HEAVY DUTY FRAME

SPECIFICATION SHEET

TAG _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing tolerances and Change Without Notice

SPECIFYING ENGINEER IS RESPONSIBLE FOR CONCRETE ENCASEMENT AND REINFORCING BASED UPON APPLICATION AND LOCAL CODES



NOTE: + Actual Channel length is 20 3/4 [527].

ENGINEERING SPECIFICATION Zurn Z887-24-HD Catch Basin shall be 23-1/4 [591] wide reveal x 24-5/8 [625] long and 24 [610] deep. Catch basin shall be made of 0% water absorbent High Density Polyethylene (HDPE). Shall mechanically lock into the concrete surround. Basin shall weigh less than 20.0 lbs. [9.1 kg]. Catch basin shall have rebar clips standard to secure basin in its final location. Shall be provided with standard DGC grates that lock down to frame. Zurn 22-1/4 [565] wide reveal Ductile Iron Slotted Grate conforming to ASTM specification A536-84, Grade 80-55-06. Ductile Iron grate is rated class C per the DIN EN1433 top load classifications. Supplied in 24 [608] nominal lengths with 11/32 [9] wide slots, and 1-1/2 [38] bearing depth. Grate has an open area of 164.00 sq. in per ft. The 1/4 [6] thick Heavy-Duty Frame Assembly conforms to either ASTM specification A36 or A536-84, with 4 - 4 [102] long concrete anchors per basin. The frame is supplied with a powder coated finish. All welds must be performed by a certified welder per ASTM standard AWS D1.1. Frames Shall be produced in the U.S.A.

PREFIX OPTIONS (Check/specify appropriate options)

____ Z High Density Polyethylene (HDPE) Catch Basin with Heavy-Duty Frame*

SUFFIX OPTIONS (Check/specify appropriate options)

Adapters

___ -E3/U3 3 [76] No-Hub End/Bottom Outlet Adapter
___ -E4/U4 4 [102] No-Hub End/Bottom Outlet Adapter
___ -E6/U6 6 [152] No-Hub End/Bottom Outlet Adapter
___ -IA Inlet Adapter (Z886)
___ -IA Inlet Adapter (Z882)

Grate Options (Load Classifications are per DIN EN1433)

____ -BDC Black Acid Resistant Epoxy Coated Ductile Grate – Class C
____ -BDE Black Acid Resistant Ductile Grate – Class E
____ -DCC Ductile Iron Solid Cover - Class C
____ -DGC Ductile Iron Slotted Grate – Class C *
____ -DGF Ductile Iron Slotted Grate – Class F
____ -GDC Galvanized Ductile Slotted Grate – Class C
____ -GDE Galvanized Ductile Grate – Class E
____ -GDF Galvanized Ductile Grate – Class F
____ -GG Fiberglass Grate - Class A

MADE in the U.S.A. (Load Classifications are per DIN EN1433)

____ -FG Galvanized Steel Slotted Grate - Class A
____ -FS Stainless Steel Slotted Grate - Class A
____ -PG Galvanized Perforated Grate - Class A
____ -PS Stainless Steel Perforated Grate - Class A
____ -RFG Reinforced Galvanized Steel Slotted Grate - Class B
____ -RFS Reinforced Stainless Steel Slotted Grate - Class B
____ -RPG Reinforced Galvanized Perforated Grate - Class B
____ -RPS Reinforced Stainless Steel Perforated Grate - Class B

Miscellaneous Options

___ -EXT 12 [305] Body Extension
___ -Y Sediment Bucket

*REGULARLY FURNISHED UNLESS OTHERWISE SPECIFIED

REV. A	DATE: 5/16/11	C.N. NO. 121299	
DWG. NO. 304903	PRODUCT NO. Z887-24-HD		

ZURN INDUSTRIES, LLC ♦ SPECIFICATION DRAINAGE OPERATION ♦ 1801 Pittsburgh Ave. ♦ Erie, PA 16514
Phone: 814\455-0921 ♦ Fax: 814\454-7929 ♦ World Wide Web: www.zurn.com
In Canada: ZURN INDUSTRIES LIMITED ♦ 3544 Nashua Drive ♦ Mississauga, Ontario L4V1L2 ♦ Phone: 905\405-8272 Fax: 905\405-1292

Fig. 6 Example Manufactured trench Drain – Zurn Z880 2-1/2 (HDPE)

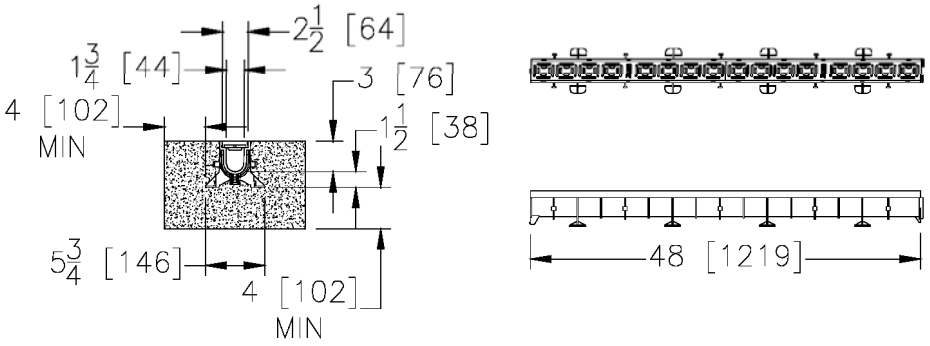
ZURN

Z880
2 1/2 [64] WIDE REVEAL TRENCH DRAIN SYSTEM

SPECIFICATION SHEET
TAG _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice

SPECIFYING ENGINEER IS RESPONSIBLE FOR CONCRETE ENCASEMENT AND REINFORCING BASED UPON APPLICATION AND LOCAL CODES



ENGINEERING SPECIFICATION: Zurn Z880 2 1/2 [64] Wide Trench Drain System shall be 48 [1220] long and 2 1/2 [63.5] wide. Drain shall be 3 [76] deep. Drain shall be made of (HDPE) High Density Polyethylene, and is UV-10 stabilized. Drain shall have bedding feet to be used for positioning and anchoring purposes. Drain shall have tongue and groove snap fit connection. Drain shall have 24 [610] long high-density polyethylene decorative grate (-POG) provided as standard.

PREFIX OPTIONS (Check/specify appropriate options)
___ Z Four-foot, Linear High Density Polyethylene (HPDE) Modular Drain Channel*

SUFFIX OPTIONS (Check/specify appropriate options)

Outlet Adapters Add/Each
___ -E1 Closed End Cap
___ -E1.5 1-1/2 [38] No-Hub End Outlet ___ -U1.5 1-1/2 [38] No-Hub Bottom Outlet

Grate Options (Load Classifications are per DIN EN1433)
___ -AWG Aluminum Wire Grate - Class A
___ -BZ Bronze Decorative Grate - Class A
___ -POG Heel-Proof Polyethylene Grate - Class A*
___ -SOG Stainless Steel Decorative Grate
___ -SWG Stainless Steel Wire Grate - Class A

Miscellaneous Options
___ -C45 45 Degree Channel
___ -C90 90 Degree Channel
___ -G45 45 Degree Plastic Grate
___ -G90 90 Degree Plastic Grate
___ -SS45 45 Degree Channel and Stainless Steel Grate
___ -SS90 90 Degree Channel and Stainless Steel Grate

*REGULARLY FURNISHED UNLESS OTHERWISE SPECIFIED

REV. A DATE: 07/03/13 C.N. NO. 129577
PROD./DWG. NO. Z880

ZURN INDUSTRIES, LLC ♦ SPECIFICATION DRAINAGE OPERATION ♦ 1801 Pittsburgh Ave. ♦ Erie, PA 16514
Phone: 814\455-0921 ♦ Fax: 814\454-7929 ♦ World Wide Web: www.zurn.com
In Canada: ZURN INDUSTRIES LIMITED ♦ 3544 Nashua Drive ♦ Mississauga, Ontario L4V1L2 ♦ Phone: 905\405-8272 Fax: 905\405-1292

Fig. 7 Example Automatic Storm Drainage Sump and Sump Pump

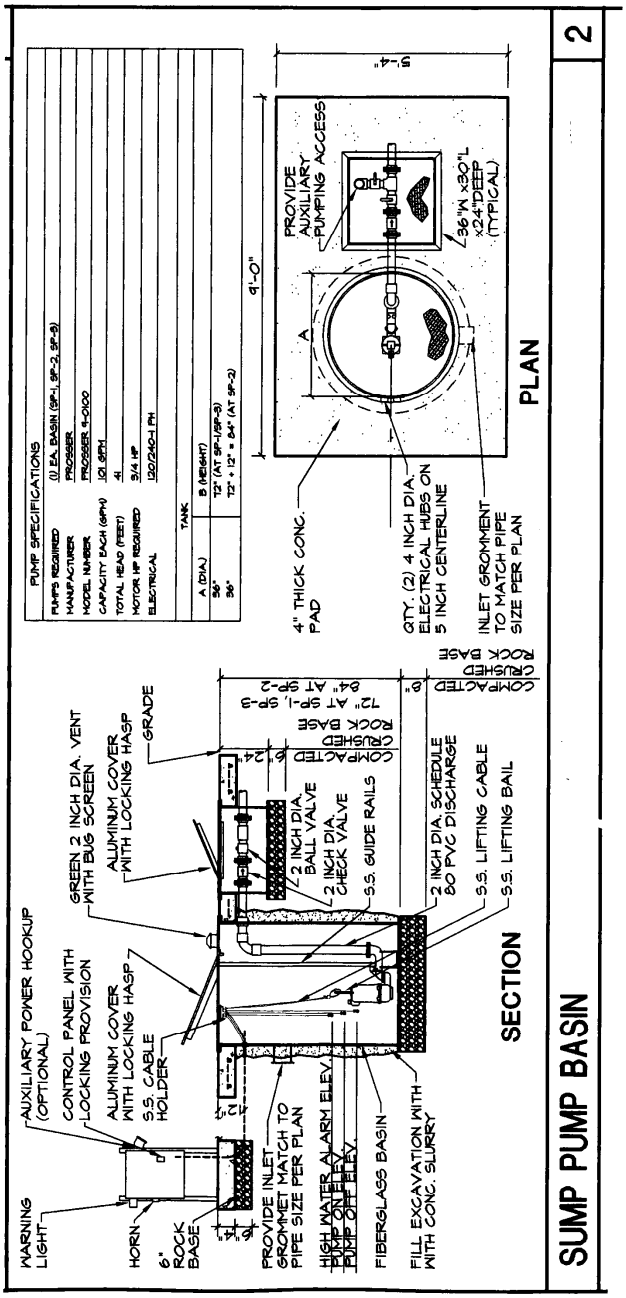


Photo No. 1 – Wading Pool Area

Photo No. 2 – Wading Pool Area, Concrete Deck and Deck Demolition

Photo No. 3 – Wading Pool Area, Concrete Deck and Deck Demolition

Photo No. 4 – Concrete Deck at NE Corner of Masonry Building

Photo No. 5 – Settlement and Cavity under NE Corner of Masonry Building

Photo No. 6 – Cavity below NE Corner of Masonry Building

Photo No. 7 – Cavity under NE Corner of Masonry Building

Photo No. 8 – Concrete Deck at NW Corner of Pool (1" Pool Settlement Location)

Photo No. 9 – Exterior Shower at NE Corner of Masonry Building

Photo No. 10 – Wet Subsoil in Trench near Wading Pool Fence

Photo No. 11 – Wet lawn and Soil Area along the West Side of the Masonry Building

Photo No. 12 – Slot Drain in Deck and Cleanout Box Failure

Photo No. 13 – Unsealed Saw-cut Control Joints and Expansion Joint at Deck

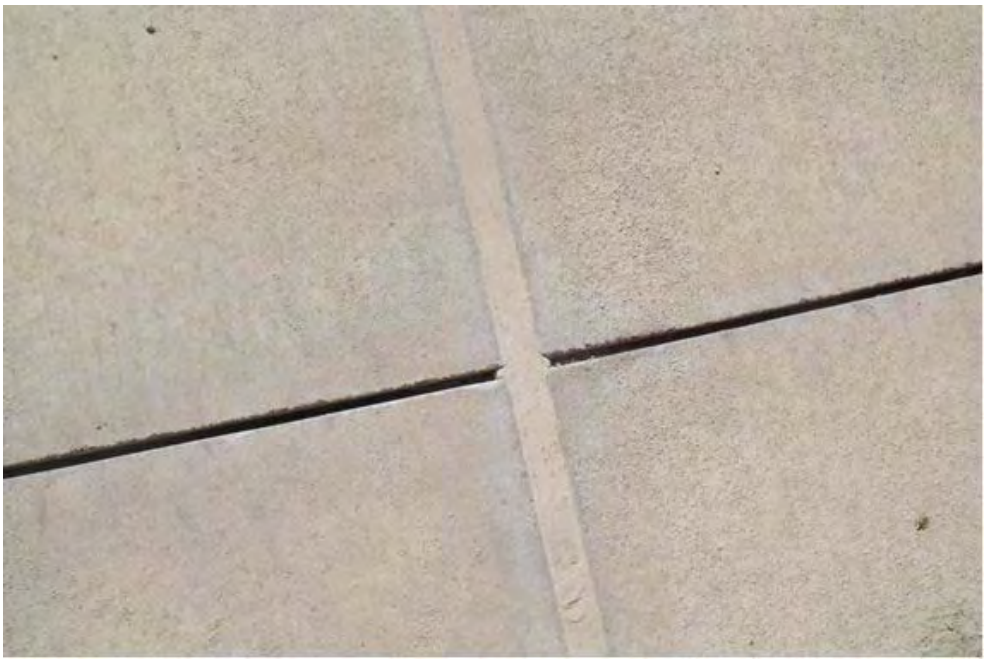


Photo No. 14 – Erosion and Deposits at Edge of Concrete Deck

Photo No. 15 – Water in Main Pool Drain at Low End of Pool

Photo No. 16 – Sounding Tube to Perforated Pipe, Access at E Side of Pool

Photo No. 17 – Diagonal Trans-Pool Cracking Patterns

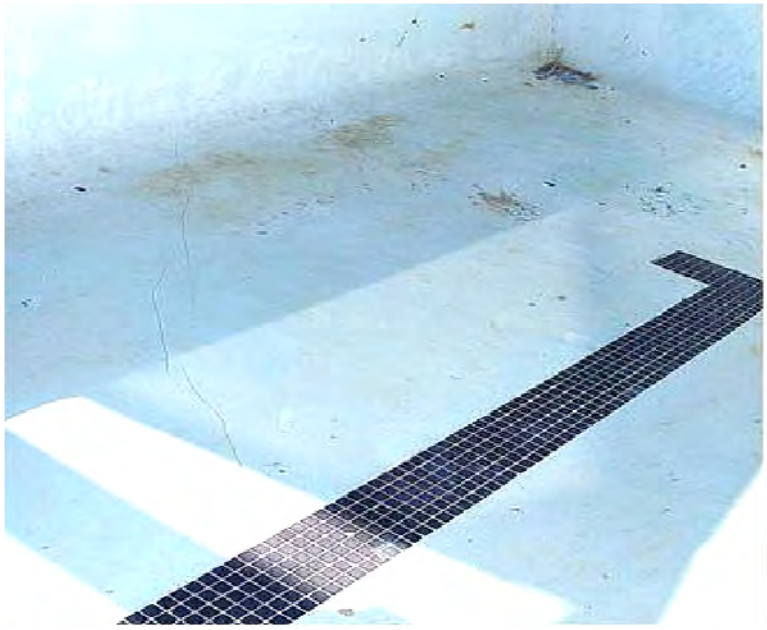


Photo No. 18 – 90 Degree Trans-Pool Cracking Patterns

Photo No. 19 – Spider-Like Cracking at Pool Water Inlets

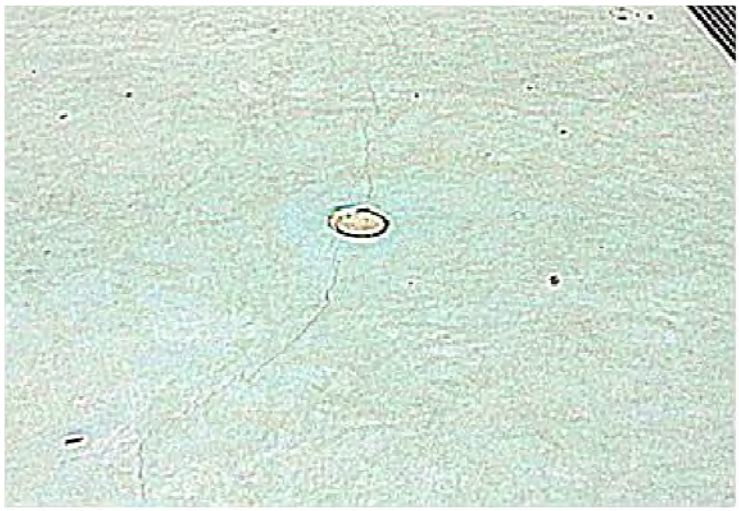


Photo No. 20 – Ameba-like Erosion Patches in Pool Bottom Plaster Finish

Photo No. 21 – Calcified Chemical Deposits in Park adjacent to NE Corner of Pool

Photo No. 22 – Damaged Fencing at NW side of Pool Enclosure

Photo No. 23 – Spider-like Cracking at Floor Drain in Men's Restroom

Photo No. 24 – Spider-like Cracking at Floor Drain in Women's Restroom

PRE- DESIGN – COST ESTIMATE
PO CN15986 November 13, 2013

Recommended Repair Description	**Estimated Repair Cost**
Preliminary Scope of Work Categories	
Site Preparation,Demolition,*Earthwork*	92,000
Remove and Replace (E) Wading Pool	90,000
Remove and replace Pool Deck *(including waterproof under slab membrane)*	105,000
Remv. & Repl. *all (assumed 100 LF only)* coping, tile, and level bond beam	16,000
Re-plaster of existing swimming pool *(assumed sandblast, patch, skim coat, new graphics)*	25,000
Epoxy inject mayor cracks *(allow.)*	10,000
Replace all wading pool piping *(allow.)*	10,000
Pressurize all remaining piping *(allow.)*	5,000
Subtotals:	343,000
Additional Pre-Design Report Categories	
Underground piping and Utilities, including: Elec., Pool, Storm, Sewer, Sub-drains and Sump/Pump	60,000
Building foundation & related repairs	50,000
Large Pool foundation repairs	64,000
Large Pool low-end sub-drain to sump	10,000
Fencing, Landscape and misc. site work	20,000
Building repairs at Women and Equip. Room floor drains, cracked slabs	8,000
Allowance for Code upgrades and Design Contingency	45,000
Construction Sub Totals	600,000
Contractor's GC, OH & P (25%)	150,000
Pre-Design Construction Est. Totals:	**750,000**
Soft Cost Categories	
Contingency (10%)	75,000
"Soft Cost" allowance, including County Project Management, A/E fees, Permits, Inspections, Testing, Geo Engineer, Special surveys and Pre-D Reviews, Advertising, printing, misc. project Expenses (approx.20%)	150,000
Pre-Design Project Cost Estimate:	**975,000**

PRE- DESIGN – SCHEDULE

PO CN15986 November 13, 2013

MILESTONE	TARGET DATE	NOTES
PSA, PO CN15986 dated Oct/10/2013	**Oct. 10,2013**	
Complete Pre- Design (PD) by:	**Nov. 27, 2013**	
Submit 100% PD Report	Nov. 13	
Completion of County Review	Nov. 27	
Complete CD Phase Preparations	**Dec 20, 2013**	
Complete project team formation and submit fee proposal for remaining phases	Nov. 29	
Completion of Review, Approval by County	Dec. 13	
Notice to Proceed with CD Phase	Dec. 20	Authorization to proceed before Christmas
Complete 50% Construction Documents (CD) by:	**March 7, 2014**	6 weeks to 50% submittal
Start of CD Phase after Holiday period	Jan 6, 2014	
Submit 50% complete CD Package	Feb. 21	
Completion of Review / Approval by County	Mar. 7	
Complete 100% Construction Documents	**Jul 9, 2014**	
Submit 100% complete CD Package	Apr. 11	
Receive corrections from initial review	Jun. 6	8 week initial review period
Completion of Review / Approval by County	Jun. 27	Corrections and final review (4 weeks)
Complete Bidding (Bid) by:	**August 22, 2014**	4 – 1/2 week Bid period (no Pre-Qual)
Provide Completed bid Package to County by	Jul. 2	
County to complete Bid process	Aug. 13	
Award of Contract and Notice to Proceed by:	Aug. 22	
Completion of Construction by:	**December 15, 2014**	3-1/2 month construction period
Mobilization on-site and start of work by:	Aug. 25	
Completion of demolition and earthwork	Sep. 12	
Completion of bldg. and pool fnd. repairs	Oct. 3	
Completion of underground utilities work	Oct. 17	
Completion of deck and pools reconstruction	Nov. 14	
Substantial project completion by:	Nov. 21	
Final Completion and Acceptance by:	Dec. 12	
Ready for occupancy by:	Dec. 15	
11th Month Warranty Inspection (1-year warranty)	**November 2, 2015**	

Pre-Design Assessment
Structural Investigation & Evaluation Report

FOR

County of Santa Barbara, Capital Projects Division

Reconstruction of the New Cuyama Aquatics Facility

290 Wasioja Street, New Cuyama, CA 93254

SB County Project No. 8736 NCPI

SSG Job No.: S13165

November 13, 2013

Contents

A. General

1. The existing complex was constructed approximately four (4) years ago. The complex consists of a 1,800 square foot restroom and equipment building, a 2,700 square foot main pool, a 400 square foot wading pool, and 7,500 square feet of associated pool deck.

2. The existing building under investigation is located in New Cuyama a Census Designated Place (CDP) in the County of Santa Barbara, (34.944N, -119.684W)

   Vicinity Map [Google®] →

3. The existing complex underwent substantial loss of soil support in a large area supporting the wading pool, main pool, pool deck and a portion of the restroom building. This loss of support caused major differential settlement and damage of some elements.

4. Loss of soil support not withstanding, it should be noted that the existing Restroom/Equipment building presents in moderate to good structural condition. It is evident that the building has been maintained with a minimum standard of care over the past few years.

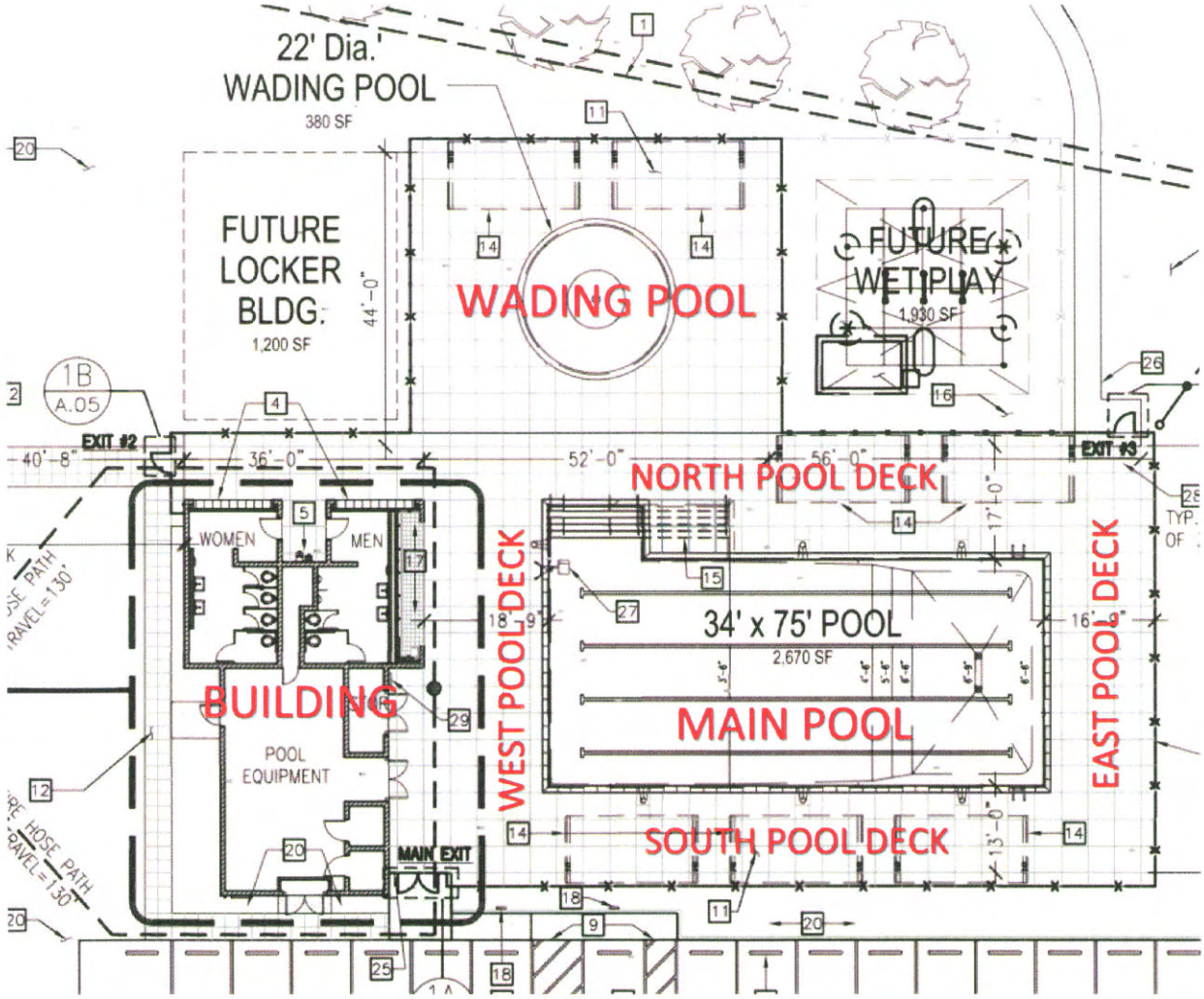
5. The age of the building allows accessibility to the as-built construction documents. (REF 5)

6. The existing building is a one story building with Concrete Masonry Unit (CMU) walls and a timber framed roof. The interior contains a concrete slab on grade. The footings were not observed completely, but are expected to be continuous and constructed of reinforced concrete per the as-built drawings (REF 5).

7. Due to the buildings recent construction, it can be reasonably expected that current practices of Jurisdictional Oversight, Third Party Special Inspections and Structural Observations were implemented.

8. The purpose of the evaluation is to provide the County of Santa Barbara with a pre-design assessment of the existing structural condition of the complex and feasible potential reconstruction options. We are in general agreement with the conclusions by Fugro Consultants, Inc (REF 6) about the events leading up to the structural damage to the complex and those events are not re-summarized herein. What is clear is that the events are not caused by a structural defect, instead the sub-grade that supported the structural elements ceased to be in supportive contact with said elements. This assessment is to discern the elements that require retrofit and/or reconstruction and to compile plausible reconstruction solutions.

B. REFERENCE SITE PLAN (REF 5 – Partial A.01) – Reference North is Up on the Page



C. Site Visit and Observations

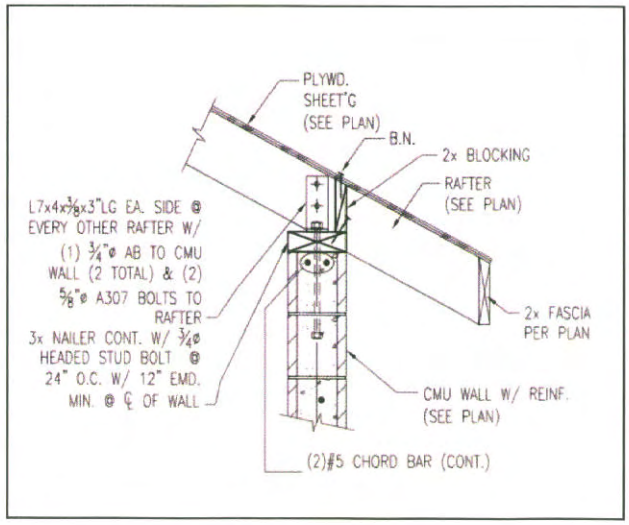
1. A site visit was made on the mid-morning October 16, 2013 to observe existing conditions of the building and surrounding pool grounds. The observations lasted approximately 2.0 hours and included access to the visible roof framing, walls, site features and all interior spaces. Persons present at the site during this visit included:
    a. Andrew Tranovich, P.E., CCP – County of Santa Barbara, Capital Projects Division
    b. Don Hertel, AIA, Principal Architect – Westberg + White, Inc.
    c. Michael Parolini, P.E., S.E. – Smith Structural Group, LLP

D. Building Roof Framing

1. The existing roof framing is timber framed with a typical ridge beam and sloped rafter system.
2. The sheathing is 5/8" plywood fully blocked with typical nailing patterns.
3. As is expected with a flexible timber system there are no visual signs of distress in the roof framing. Embedded anchors and members are in generally good structural condition. The roofing material does not show any signs of distress due to the differential settlement evident at the foundation level.
4. It was noted that the south facing fascia and trimwork is showing signs of early deterioration. The sun exposure in the Cuyama valley can be a direct cause of this early fading and peeling of paint which will expose the timber materials to the elements. This is unrelated to the soil incident at hand, but it is noted as a maintenance item that will probably come back sooner than expected for this building due to its harsh environment.

E. Building Walls

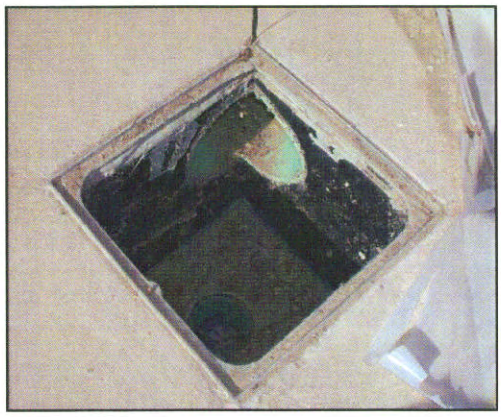
1. The existing structural walls are constructed of 8" nominal thickness CMU block. The block is laid with a standard running bond pattern. There are interior plumbing walls that are constructed of 4" CMU walls of similar construction.
2. The existing walls along the eave conditions are anchored for out-of-plane forces to roof framing per detail 5/S5.01. This detail utilizes angle clips to the top of the wall and bolts to 2x rafters. This connection over-restrains the depth of the rafter for shrinkage. In addition the use of the 2x rafter is in violation of the minimum size for wall out of plane anchorage of 3x (2.5").
3. The walls along the rake condition do not have directly discernable anchorage path to resist out-of-plane forces. It is possible that these walls were designed to span horizontal between perpendicular walls.



4. The existing walls present with several areas of vertical cracking which are consistent with differential settlement in the areas with loss of soil support. Areas without loss of soil support present in good condition with no visible cracking.

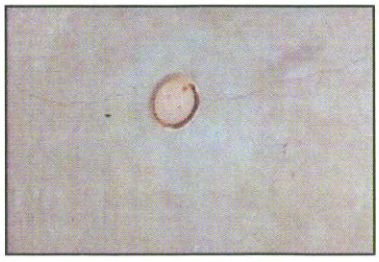
F. Pool Deck Area

1. The majority of the existing pool deck in the area of soil collapse has been removed. The major utility trenches have been hand excavated to expose pressurized piping lines and electrical conduits.
2. The existing slabs were observed to exceed the construction documents requirement of 5" thick concrete with #4 bars at 12" each way. This is a tight reinforcing spacing, and the specification is within code limits for slab-on-grade construction.
3. The pool deck is not doweled or connected to the structural foundation of the building. This is consistent with the construction documents detailing. This is also common for contemporary building construction. However in the area with the outdoor showers, this lack of continuity may have led to excessive moisture entering the sub-grade space after the initial movement occurred.
4. The slot drains and cleanouts that were installed on the North and West ends of the main pool are subject for possible long term water intrusion below the pool decks. It was documented during site observations that the installation of the details provided by the construction documents were not sealed properly at cleanouts.



G. Main Pool and Wading Pool

1. Both the Main pool and wading pool were unfilled at the time of observation.
2. Per the As-Built Construction Documents (REF 5), both pools are constructed of reinforced shotcrete (concrete). The thickness of the pool sides and bottom vary depending on the depth of the pool.
3. Several cracks were observed during initial site observations at the main pool.
    a. Small cracks consistent with temperature and shrinkage of standard concrete construction were evident around and between various filler valve penetrations at the base of the pool. These cracks may have been enlarged do to the overnight cooler temperatures and lack of water in the pool which would expose the pool to larger than normal temperature swings.



b. Vertical cracking was observed at the eastern edge of the stairs. The cracking telegraphed across the pool bottom, and is likely caused by tensile stresses at the abrupt change in plan geometry. The tensile stress is likely directly related to the settlement of the northwest portion of the pool.

4. Do to the loss of soil support at the northwest corner of the main pool it is evident from the waterline stain that it has settled over an inch from initial level.
5. The coring study completed by Fugro Consultants, Inc. (REF 8) determined there are no voids directly beneath the bottom of the pool lining. The Pool bottom rests directly on an 18" layer of 3/8" clean crushed rock over geo-fabric. The design documents call for a total gravel layer of 24".
6. The Wading pool has lost soil support over a major portion of its base. In addition, the majority of the pool deck surrounding the wading pool has been removed and the utility trenches excavated. The combination of these two items has caused major differential settlement of the wading pool. It can no longer function for its intended purpose and is not serviceable in its current state.

H. Lateral Force Resisting Systems and Seismic Parameters

1. The subject complex is located in a moderately high seismic risk area. With a mapped Maximum Considered Earthquake, five percent damped, spectral response acceleration parameter at short periods of 1.465g, strong shaking can be expected at this location due to seismic events.
2. The existing Main Lateral Force Resisting System is comprised of reinforced concrete block walls at the exterior and interior of the building.
3. It is discernable that the building's lateral load resisting system is mostly intact with the exception being the supporting foundation at the northeast corner where soil is not in contact with the foundation. If a moderate seismic event were to occur with the building in its current state, it is likely that further structural damage can be expected do to lack of resistance at the foundation level.
4. Seismic Parameters as determined by United States Geologic Survey website and code analysis:

Longitude:	-119.684W	Latitude:	34.944N
S_S:	1.465g	S_{DS}:	0.98g
S_1:	0.600g	S_{D1}:	0.60g
Site Class:	D	Seismic Design Category (SDC):	D

I. Building Foundations

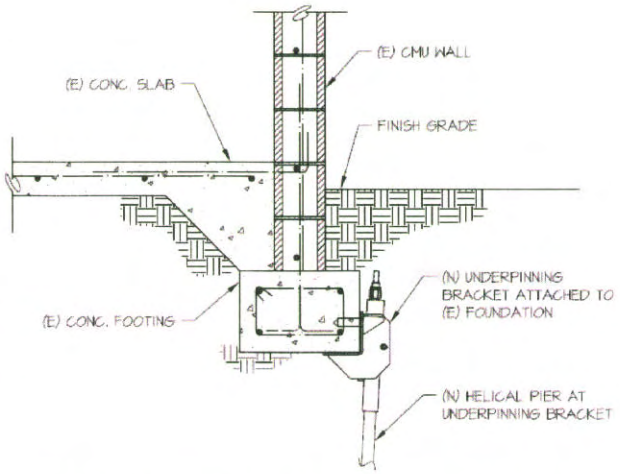
1. The existing foundation is comprised of shallow continuous reinforced concrete bearing footings under the CMU bearing walls.
2. The existing foundations were partially observable in areas of adjacent pool deck removal. The makeup of the existing foundations appeared to be consistent with the construction documents (REF 5). Several of the footings at the North East corner of the building are not supported by soil. The supporting soil has collapsed and/or been washed away from the bottom of the footing.
3. The construction documents call for a 5" thick concrete slab-on-grade with #3 bars each way at 16" on-center. This configuration would provide a reinforcement ratio of (0.11 in^2 / 5"x16") = 0.001375 = ρ. Per 2001 CBC §1907.12.2.1 ρ_{min} = 0.0020 for Grade 40 bars. This would equate to #3 bars at 11" on-center or the use of #4 bars at 20" on-center.
4. There are many areas throughout the building which present with cracking in the slab on grade.
    a. Some areas have minor hairline cracks consistent with shrinkage of concrete at plan geometric abnormalities.
    b. These cracks in the slab on grade are more pronounced and larger in spreading in the restroom areas where loss of soil support and voids are recorded in the Slab Coring results (REF 8)

J. Site Conditions including Shade Structures

1. It was observed at the West side of the building that the flatwork was settling and pulling away from the building. The slope beyond was also observed to be very wet in the turf grass up to six inches of depth. This is an indication that excess water exists along this slope to the west near the drainage basin.
2. The chain link fence footings have been undermined in several areas. These areas will require removal and replacement.
3. Shade Structures on the North and South end of the complex are supported by concrete foundations that have no indication of excessive settlement during initial site observations. The non-building structures are comprised of a steel cantilever system and are expected that minor settlement at the foundation will not decrease their current functionality.

K. Conclusions and Recommendations

1. Prior to any full structural solution being implemented to retrofit any portion of the complex, additional geotechnical recommendations will be required for current design values. In addition, design information and feasibility of lateral support related to underpinning will be required. The Geotechnical Engineering consultant shall be given the opportunity to review and comment regarding the contents of this report.
2. Restroom and Equipment Building
    a. The building presents in minor distressed condition due to the loss of supporting soil at the north east corner. However the combination of a flexible roof, stiff walls and spanning capability of the foundation has kept the building from sustaining irreversible structural damage.
    b. It is recommended that the footings and underslab areas with voids be pressure grouted to fill all voids. The operation of pressure grouting will achieve best results if it is done from inside through the slab on grade with the exterior perimeter confined. This allows for the pressure to better flow or push the grout into all the voided space under the slab and footings. Direction and location of underslab utilities and drains will be required to be documented prior to any grouting operations taking place.
    c. In addition to the building's slab-on grade being under-reinforced by code and for the type of soil encountered at the site, there is no indication of requirements for additional reinforcement to help prevent cracking at geometric abnormalities or floor penetrations. This type of construction would normally see trim bars to help minimize the opening of cracks at these types of conditions.
    d. Underpinning of the existing building shall be provided in areas of loss of support. Depending on the system chosen, minor recovery of settlement may be acheieved. Underpinning would be provided by the use of foundation brackets attached to helical piers or other similar method. Upon completion of the underpinning operations, grouting at existing footings would be required at all voids.



    e. The cracking in the internal slab-on-grade that exceeds standard temperature cracking shall be epoxy injected and repaired. This is especially important in the bathrooms where wet patrons, plumbing mishaps and daily wash-downs are expected in the future.
    f. Daily wash downs occur in the restrooms within the building envelope. This water is then drained by the bathroom floor drains. Further investigation may be required to verify that these connections are not leaking water into the building pad on a daily basis during normal operation.

3. Pool Deck Areas

    a. The pool deck has been identified as a major contributor to the initial introduction of water to the subgrade layer with hydroconsolidation potential below the pool deck. Therefore it is recommended that every step be undertaken to achieve an impermeable pool deck as possible. Protection of the pool deck will include protection of the overall building pad.

    b. Due to the building pad being comprised partially of soils with a high potential for hydroconsolidation, it is recommended that the new pool deck be replaced with new concrete and extra care taken in the water tightness of the system. The extent of this replacement should include the West side of the deck between the pool and the building, the area completely around the wading pool, and the northern section of the deck which contains existing slot drains.

    c. All control joints and cold joints shall be sealed.

    d. New slot drains shall be installed along with new cleanouts in the locations of the old slot drains. Due to the extreme temperature swings that are regularly experienced in the Cuyama Valley, drains that are embedded in the concrete slab shall be steel. In addition the finish or material chosen shall be compatible with the type of chlorinated water expected to be on the pool deck.

    e. The water tightness of the slot drain system, including around the cleanouts should be made to be redundant. This may be accomplished by a vapor barrier layer of at least 15 mil thickness directly under the pool deck and associated drainage.

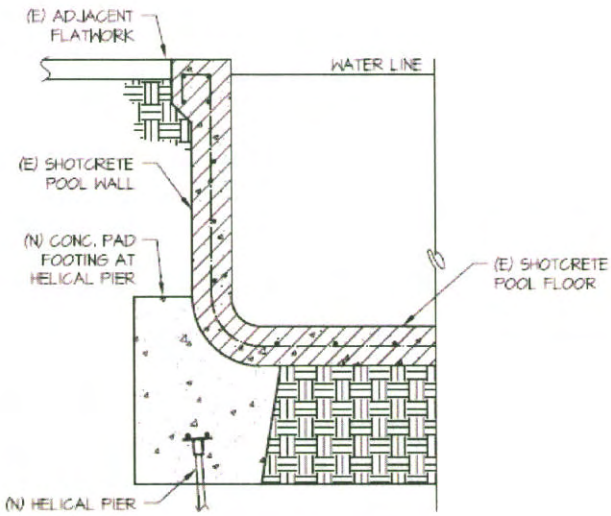
    f. The shower heads at the outdoor showers are not properly maintained, and it is evident that most of the water from the showers is not being collected by the shower drains within the building envelope. The shower heads shall be corrected, and maintained to keep the majority of the water from spraying directly onto the pool deck area.

4. Main Pool

    a. The main pool's performance must be evaluated in its current state of settlement at the northwest end. A qualified pool expert should advise the design team that all pool systems would operate at full capacity as intended should it be stabilized in its current condition.

    b. Lifting or leveling the pool in position is not structurally advisable, as this may cause more damage or new voids at the bottom or sides of the structure. It is recommended that the pool be stabilized in place on the West end of the pool where soil collapse was prevalent.

c. The stabilization of the main pool shall be achieved by underpinning with helical piers with cap brackets and thrust blocks of reinforced concrete. This solution will require excavation of the soil directly adjacent to the pool walls in the shallow west end. This operation will be most successful should it be done in stages much like a 'checkerboard' grading operation.



d. Per the original soils report by GSI Soils, Inc. the Main Pool should have been constructed with a drainage system under and around the pool connected to a sump pump. It is recommended that a system similar to that recommended in the original report be designed and subsequently installed during the exposure of the West end of the main pool.

e. Replacement or repair of the pool's plaster finish will be required to repair cracks and potential for future leaks.

5. Wading Pool

a. Supplemental support and repair for the existing wading pool is not feasible. It is recommended that the wading pool be removed and replaced in its entirety per the original plans.

b. Geotechnical recommendations will be required to replace or augment the existing subgrade which had been previously prepared with on-site native soils. These on-site native soils have subsequently been determined to have hydroconsolidation potential.

L. Limitations

This evaluation includes only a generalized visual inspection and observation of the subject complex. It does not include and specifically excludes, opening and observation of inaccessible areas, testing of any nature (either destructive or non-destructive), subsurface exploration and detailed specific inspection of the subject property unless otherwise discussed herein based on results of said testing provided by others.

Results of this evaluation and opinions expressed in this report are based on a visual examination of the project site. We believe our observations and interpretations at this site conform to current applicable engineering techniques and principles practiced locally.

M. References – Noted thus: (REF #)

(REF 1) *2001 California Building Code* (CBC) [Based on the 1997 Uniform Building Code] By California Building Standards Commission (CBSC), effective January 1, 2002

(REF 2) *Building Code Requirements and Specification for Masonry Structures*, TMS 402-05/ACI 530-05/ASCE 5-05 & TMS 602-05/ACI 530.1-05/ASCE 6-05 as reported by the Masonry Standards Joint Committee (MSJC), as referenced by the 2007 CBC

(REF 3) *Minimum Design Loads for Buildings and Other Structures*, American Society of Civil Engineers (ASCE) 7-05, as referenced by the 2007 CBC

(REF 4) United States Geological Survey (USGS), *Java Ground Motion Parameter Calculator* http://earthquake.usgs.gov/hazards/designmaps/javacalc.php

(REF 5) *As-Built Construction Documents*, Prepared by The Austin Company, Final Revised Drawings Dated January 5, 2010

(REF 6) *Evaluation of Hydroconsolidation Potential New Cuyama Aquatics Facility*, Prepared by Fugro Consultants, Inc., Dated April 2013 (Revised May 2013)

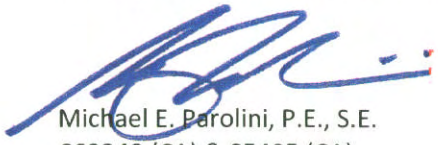
(REF 7) *Draft Scope of Work, Reconstruction of the New Cuyama Aquatics Facility*, Prepared by the County of Santa Barbara, Draft Revised July 12, 2013

(REF 8) *Geotechnical Data Report of Hand-Auger Drill Holes and Concrete Slab Coring, New Cuyama Aquatics Facility, New Cuyama, California*, Prepared by Fugro Consultants, Inc., Dated September 25, 2013

(REF 9) *Pre-Design Assessment Report --- 80% Draft*, Prepared by Westberg + White, Inc., Dated November 4, 2013

If any questions or comments arise during review of this report, please feel free to contact our office.

Thank you for your time and consideration.



Michael E. Parolini, P.E., S.E.
C69340 (CA) & S5405 (CA)

N. Appendix

1. TBD

WESTBERG + WHITE, INC.
ARCHITECTS AND PLANNERS

MEETING MINUTES

New Cuyama Pool Incident Reconstruction — ***Meeting No. 1 – Initial Site Visit***
290 Wasioja Street, New Cuyama, CA 93254 — ***October 16, 2013***

COUNTY OF SANTA BARBARA
General Services, Capital Projects Division
1105 Santa Barbara St., Santa Barbara, Ca 93101

County of SB - P.O. #CN15986
Minutes issue date: 10-23-13
W+W #13032

PARTICIPANTS:	Position	Representing	Preferred Contact
Andrew Tranovich	Project Manager	County of Santa Barbara	805-560-1079 andrewt@countyofsb.org
Michael Parolini	Structural Engineer	Smith Structural Group	805-439-2110 ext 103 michael@smithstructural.com
Don Hertel	Principal Architect	Westberg + White Architects, Inc	805-346-2991 dhertel@wwarch.com

DISTRIBUTION:	October 23, 2013, to all Participants above, and the following:		
Celeste Manolas	Capital Projects Mgr.	County of Santa Barbara	(805)568-2622 cmanolas@countyofsb.org
Todd Morrison	Project Manager	County of Santa Barbara	805-934-6228 tmorris@co.santa-barbara.ca.us

ITEM	ACTION	DESCRIPTION
General		**The purpose of the Initial Site Visit was to familiarize structural engineer Michael Parolini with the site, pool and building facilities and observable existing conditions. Also Don Hertel examined observable conditions for a second time, having visited the site briefly prior to submittal of a proposal for the work. The participants walked around the site and through the building, taking pictures and discussing observations made. No destructive investigations were made. Photos were taken by Don Hertel and copies provided to the participants. Weather conditions were clear, moderately warm and sunny, low wind. Todd Morrison arrived at the end of the visit following completion of a separate meeting nearby.**
Old Business		***(None)***
New Business		***(Discussion Notes and Observations, by Don Hertel)***
1.01		
10/16/13	**DH/MP**	**The purpose of the visit was to gather information for use by Don and Michael in performance of Pre-Design Phase Services, to include review of**

NOTE: *These minutes shall be considered valid unless response is made within 5 days of receipt. Forward any additions/corrections to the Architect at the fax number or address indicated below.*

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www.wwarch.com

ITEM	ACTION	DESCRIPTION
		all prior reports and site conditions, interviews as necessary with previously contracted consultants and preparation of an Assessment Report, including descriptions of any observed weaknesses that should or could be addressed at the discretion the County. The Report shall also include an estimate of probable costs and an updated project schedule. **The damage caused by the collapse and erosion of sub-soils at the deck area between the wading pool and building was observed. All of the exterior sink holes were exposed and debris from the collapse and from the partial demolition of concrete decking was still present.**
1.02 **10/16/13**	**AT**	**Andrew: The County's intent is to rebuild per the existing construction plans. Alternative recommended reconstruction details may be proposed for County consideration. Corrective work suggested but possibly not directly related to the pool Incident may be noted for consideration by the County.**
1.03 **10/16/13**	**DH/MP**	**Pool Area Notes** **1. The northwest corner of the pool has settled approximately 1 inch, cracks are noticeable directly and diagonally across the bottom of the pool from the eastern end of the steps. The crack extends up the pool wall and along the deck joint at the east end of the steps. The settlement is evidenced by the waterline mark, which indicates it may have occurred some time ago.** **2. A separate pattern of radial and connecting cracks is present in the pool bottom especially evident around the pool filling ports. Michael thought these may be in part related to temperature cracking relating to drainage of the pool, thereby allowing the concrete bottom to be directly exposed to the sun.** **3. Water was observed in the two square drainage inlets at the low area of the pool. Don thought that this may be remnant water left in the water circulation system since the circulating pumps have been turned off, since there is no gravity drainage outlet provided and the pumps are higher than the drains.** **4. The pool settlement issue was discussed briefly. A possible solution would be to stabilize the settled area in some manner to prevent further settlement (possibly use deep underpinning), when the collapsed deck area is excavated and then live with the out of level condition, as long and the pool drainage and circulation system will function correctly.** **5. The finished plastering of the pool lining, especially at the bottom in places where standing water occurred, has been dissolved, eroded leaving irregular spalled patterns in the finish. This may require refinishing of the pool lining.**
1.04 **10/16/13**	**DH/MP**	**Deck, Walk and Planter Areas Notes** **1. Don observed that the construction of the deck slot drains and inlet boxes may have contributed to the deck settlement and failure by leaking water under the slab. It appears that the decking should be replaced to include the full extent of the settled areas and where the slot drains and inlet boxes occur so a new detail can be employed. It was observed that the concrete deck construction was solid, uniform and of a thicker than usual cross section. Smaller aggregate was used in the deck construction than in the building floor slab construction. Deck slabs were poured directly on compacted fill without a permeable layer. Concrete decks adjacent to the building were not doweled in to the building perimeter slab**

ITEM	ACTION	DESCRIPTION

and the deck had pulled away from the building as a result of the settlement and collapse.

2. Don observed that if the exposed sink hole areas are left unprotected, further damage may occur when the rainy season starts. Michael observed that the piles of excavated dirt left on the pool deck should be removed or protected to prevent silting up of piping. *(P.S.by Don: SWPPP requirements may apply at this stage, since the site is in a sense, under construction).*

3. Michael noted that some of the soil exposed in open trenches near the wading pool and also near the perimeter fence show water intrusion. A whitish effervescent deposit was present on the damp portion of the upper soil layer. Don observed it may relate to the lawn irrigation in the adjoining park since there hasn't been any rain lately.

4. Michael noted that a color-texture change/stratification of the soils is clearly visible in the exposed pipe trenches, with a stiffer more clay-silt lower portion (possibly native soils) and an upper more sandy layer (possibly imported fill). Don suggested it would be helpful to see any daily inspection reports for earthwork or drainage piping if available to find out if native material was used to backfill trenches. Andrew said he would provide copies of the ones available *(subsequently received by don and Michael by email link).* **Andrew noted that the original soils work was by GSI. Robert Jones was both a subcontractor to Defferville and did work as a prime contractor in the wading pool area and parking lot – all to the same specification.**

5. As noted in previous visits, the deck drainage inlet collector box in the area between the wading pool, building and the NW corner of the pool appears to have had the most serious leakage and may have precipitated the soil collapse which led to pressure pipes breaking and the subsequent sink hole wash out. The pipe exiting the bottom of the box was set in a roughly cut hole that was not sealed. Also, noted by Michael the pipes leading into the box were cut flush with the sides of the box and also not sealed. This method was observed in the other inlet boxes.

6. Andrew noted that when the washout occurred, water exited through the main drainage outlet pipe which led to the rock filled bio-swale at the western edge of the site, between the building and the access road. The water flooded the bio-swale, crossed the road and ponded on the road and across the road. It left a heavy coating of silt in the bio-swale and nearly filled a vertical 12" PVC overflow / French drain within the bio-swale.

7. Andrew noted that the piping in the exposed pipe trench leads to a future water play area on the northeast corner of the site and that those pipes were pressure tested and found to be in good condition.

8. Michael and Don noted that the pool deck areas at the south, east and northeast corner of the pool are sheet drained to the planter areas. White powder was noted on the surface in those planter areas indicating chemicals in the pool water are entering the ground and forming surface deposits. It would be preferable not to drain the pool water directly onto the ground where it might leach into ground water.

9. Subsidence and eastward movement of the concrete walk along the west side of the building, previously noted by Don, was examined. It was noted that the ground in the planters adjacent to the building as well as most of the lawn area between the walk and the bio-swale was damp and upper layers of the soil were saturated. It appears that where the walk way embankment is unrestrained on its west side opposite the bio-swale, it has moved westward and downward. Walkway cross-slopes in the center portion opposite the equipment room door exceed 5% and are non-

ITEM	ACTION	DESCRIPTION

accessible. This area also overlies the large pipe trench that runs from the pool equipment room, around the west and north sides to the pool area. Trench backfill specs and construction information should be reviewed. Consideration should be given to reconstruction of the walkway, including removal of irrigated planting and lawn areas and reinforcement of the western embankment and replacement with a non-irrigated landscape ground cover such as decomposed granite. Areas adjacent to the building should be provided with positive drainage means. It is probable that the irrigation is causing the problem but there could be leaking pipes in the pipe trench or from some other source. If the trench is opened for reconstruction the piping should be examined.

10. Ponding water was observed at the street edge next to the end of the northern side walk extension to the street. There may be a broken irrigation line or head in this area.

11. Planters with shrubbery along the south face of the building were also damp, however no subsidence was observed. Burning of the plant leaves was observed and it may be advisable to have the soil tested and planting reviewed by a landscape architect to determine if the planters should be removed or modified.

12. Concrete walkways and fencing along the northern side of the building suffered more serious cracking and subsidence due to the main sink hole event and should be replaced. Fencing along the western side of the wading pool should be replaced. The embankment adjacent to the facility (in the adjoining Park) should be re-graded and the irrigated lawn areas removed and replaced with a non-irrigated landscape ground cover such as decomposed granite to prevent water intrusion into the fill material. This approach of removing irrigated lawn areas adjacent to the fencing should be considered along the north, west and east sides of the facility where the built-up pad under the pool and deck areas slopes downward in to the Park.

13. The location of the primary sink hole event and surface discoloring of the concrete deck area adjacent to the outdoor shower area suggest that the weaknesses in the drainage system construction may have been made worse by the constant wetting of the sink hole area by shower spray and the traffic of pool users from the pool steps to the showers and restroom areas. It is likely that the sub-soil failure was gradual at first as water seeped down from unsealed slot drains in the deck and from the unsealed collection inlet box serving the area. As the area began to subside, the expansion joints adjacent to the building would have started to fail increasing water intrusion. Because of the relative stiffness of the concrete deck, below deck slab subsidence may have increased to the point where pressure pipe connections began to fail without being noticed on the surface. Once the pressure pipes burst, the washout and deck collapse would have occurred rapidly. Consideration should be given to modifying the outside shower area design to limit excessive overspray onto the pool deck.

14. Observations confirm previous assumptions that the wading pool, most of the deck area around the wading pool, the deck and walk areas on the north side of the building and on the west and most of the northern side of the pool, along with related drainage systems and any damaged piping and equipment, should be removed and reconstructed.

15. Don observed that the piping exposed in the sink hole trenches was a thermoplastic pipe material. Drainage piping was marked as schedule 40 and had a greenish color. The water piping at the trench bottom had a darker gray color. Since thermoplastic piping is known to deteriorate

ITEM	ACTION	DESCRIPTION
		under UV exposure, the specifications and condition of the intact piping should be checked prior to covering it.
1.05 **10/16/13**	**DH/MP**	**Restroom and Equipment Building Notes** **1. The substantial void below the northeast corner of the building and masonry wall cracking at the wall between the shower area and the Boy's Restroom indicate that the building has settled at its northwest corner. A solution involving underpinning may be required.** **2. A pattern of radial cracking was observed in the Boy's Restroom floor slab that radiated from the central floor drain. A similar pattern was also observed around floor drains in the Girl's Restroom and at one central floor drain in the Equipment room. Some of the cracks appeared to have widened recently since it was observed that the dust on the floor was not present in some of the cracks. The supplemental slab borings taken recently in the Girl's Restroom and Equipment room did not reveal voids below the slab, but the borings were not taken proximate to the floor drains associated with cracking. There is a possibility that the floor drains or the connected drain piping may be leaking and may have caused some subsidence in the area of the drain.** **3. Michael observed some cracking in the floor of the mechanical chase at the center of the building but the cracks did not continue up the walls and it is assumed that they are normal hairline temperature or minor stress cracks.**

Submittal Status ***(None)***

RFI Status ***(None)***

Change Orders ***(None)*** ***Issued Proposal Amount Approved***

Project Schedule ***(TBD)***

Target date for delivery of substantially complete draft pre-design report to County for review: Friday November 1, 2013.

Target date for next meeting (following County review of the draft report): Friday November 8, 2013.