

From: [Rhonda Braswell](#)
To: [FOIA Requests \(CDC\)](#); [Kocher, Paula L. \(CDC/OCOO/OGC\)](#)
Subject: FOIA Request for Records
Date: Thursday, August 6, 2020 11:32:18 AM
Attachments: [image001.png](#)
[2020.08.06 FOIA Ltr Req to CDC.pdf](#)
[KWD CDC Release Form.PDF](#)
[MSDPH Investigation Report.pdf](#)
[KWD Death Certificate.pdf](#)
[Ltrs of Administration.pdf](#)

Good morning,

Please see attached correspondence together with documentation to support my request. Please confirm receipt and, if possible, provide an estimated response time to my request.

Do not hesitate to contact me should you have any questions or need any additional information.

Thank you. Rhonda

Rhonda Braswell
Paralegal

MORRIS HAYNES, Attorneys at Law
3500 Colonnade Parkway, Suite 100
Birmingham, AL 35243
O: (205) 324-4008 | F: (205) 324-0803





Centers for Disease Control
and Prevention (CDC)
Atlanta GA 30333

December 9, 2020

SENT VIA EMAIL

Rhonda Braswell
Morris Haynes Wheelers Knowles & Nelson
3500 Colonnade Parkway, Suite 100
Birmingham, Alabama 35243
rbraswell@mhhlaw.net

Dear Ms. Braswell:

This letter is our final response regarding your Centers for Disease Control and Prevention and Agency for Toxic Substances and Disease Registry (CDC/ATSDR) Freedom of Information Act (FOIA) request of August 6, 2020, assigned #20-02155-FOIA, for:

any and all records pertaining to the legionella case/outbreak/investigation pertaining to Kathy W. Douglas (State Investigation# xxx). Mrs. Douglas was exposed to legionella pneumophila in approximately June 2019, while she was a visitor at Quapaw Bath and Spa facility in Hot Springs, Arkansas.

Please provide us with any and all documents you may have pertaining to Mrs. Douglas and/or the legionella outbreak associated with visitors at Quapaw Bath and Spa facility in Hot Springs, Tennessee in June 2019.

Also, provide us with any and all documents you have pertaining to any exposure to legionella pneumophila, at Quapaw Bath and Spa facility, for the past 5 years. . . .

We received your fee limit of \$150.00 email dated October 13, 2020.

We also received your search terms agreement email dated October 5, 2020, which you agreed to the following search terms: "Quapaw" within 10 words of "hot springs".

We located 88 pages of responsive records (66 pages released in full; 22 pages released in part). After a careful review of these pages, some information was withheld from release pursuant to 5 U.S.C. §552 Exemptions 5 and 6.

Exemption 5 protects inter-agency or intra-agency memorandums or letters which would not be available by law to a party other than an agency in litigation with the agency. Exemption 5 therefore incorporates the privileges that protect materials from discovery in litigation, including the deliberative process, attorney work-product, and attorney-client privileges. Information withheld under this exemption was protected under the deliberative process privilege. The deliberative process privilege protects the decision-making process of government agencies. The deliberative process privilege protects materials that are both predecisional and deliberative. The materials that have been withheld under the deliberative process privilege of Exemption 5 are both predecisional and deliberative, and do not contain or represent formal or informal agency policies or decisions. Examples of information withheld include deliberative conversations.

Exemption 6 protects information in personnel and medical files and similar files when disclosure would constitute a clearly unwarranted invasion of personal privacy. The information that has been withheld under Exemption 6 consists of personal information, such as cell phone numbers. We have determined that the individuals to whom this information pertains has a substantial privacy interest in withholding it.

We have received your check dated October 12, 2020, for payment in the amount of \$1702.00.

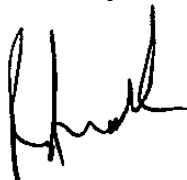
You may contact our FOIA Public Liaison at 770-488-6277 for any further assistance and to discuss any aspect of your request. Additionally, you may contact the Office of Government Information Services (OGIS) at the National Archives and Records Administration to inquire about the FOIA mediation services they offer. The contact information for OGIS is as follows: Office of Government Information Services, National Archives and Records Administration, 8601 Adelphi Road-OGIS, College Park, Maryland 20740-6001, e-mail at ogis@nara.gov; telephone at 202-741-5770; toll free at 1-877-684-6448; or facsimile at 202-741-5769.

If you are not satisfied with the response to this request, you may administratively appeal by writing to the Deputy Agency Chief FOIA Officer, Office of the Assistant Secretary for Public Affairs, U.S. Department of Health and Human Services, Hubert H. Humphrey Building, 200 Independence Avenue, Suite 729H, Washington, D.C. 20201. You may also transmit your appeal via email to FOIARequest@psc.hhs.gov. Please mark both your appeal letter and envelope “FOIA Appeal.” Your appeal must be postmarked or electronically transmitted by Tuesday, March 9, 2021.

Additionally, documents (776 pages) that originated by National Park Service (NPS) were found in our search. Your request and NPS’s equity were referred to the NPS’s FOIA Office for a direct response to you. The information you requested falls under their jurisdiction. Should you have questions about the status of your request, you may contact:

Ramona Turner
601 Riverfront Drive
Omaha, NE 68102
Phone: 402-312-2521
Fax: 402-661-1737 (call to confirm receipt)

Sincerely,



Roger Andoh
CDC/ATSDR FOIA Officer
Office of the Chief Operating Officer
Phone: (770) 488-6399
Fax: (404) 235-1852

Enclosures

20-02155-FOIA

From: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
Sent: Fri, 4 Jan 2019 15:08:09 +0000
To: Said, Maria
Cc: CATHERINE.WATERS@ARKANSAS.GOV;Debbie.Pledger@arkansas.gov;NCID DBMD Travel-Legionella (CDC);David Kostamo;Lauren Miller;Haselow, Dirk (CDC arkansas.gov)
Subject: RE: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis (b)(6)

That sounds great – please let us know what time works best for you all. We are flexible here today.

Best,
Sooji

From: Said, Maria <maria_said@nps.gov>
Sent: Friday, January 4, 2019 9:45 AM
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Cc: CATHERINE.WATERS@ARKANSAS.GOV; Debbie.Pledger@arkansas.gov; NCID DBMD Travel-Legionella (CDC) <travellegionella@cdc.gov>; David Kostamo <david_kostamo@nps.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Lauren Miller <lauren_miller@partner.nps.gov>; Haselow, Dirk (CDC arkansas.gov) <dirk.haselow@arkansas.gov>
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC45011

Thanks Sooji.

I just got off the phone with Dirk Haselow, the state epi in Arkansas. I would certainly be open to a call. I am cc'ing Dirk here too.

Maria

On Fri, Jan 4, 2019 at 9:39 AM Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov> wrote:

Hi Maria,

Laura is out of the office, but we can certainly have a call today. We are pretty flexible – please let us know what time works best on your end.

Would anyone from Arkansas be available also for the call?

Many thanks,
Sooji

From: Said, Maria <maria_said@nps.gov>
Sent: Thursday, January 3, 2019 5:41 PM
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Cc: CATHERINE.WATERS@ARKANSAS.GOV; Debbie.Pledger@arkansas.gov; NCID DBMD Travel-Legionella (CDC) <travellegionella@cdc.gov>; David Kostamo <david_kostamo@nps.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Lauren Miller <lauren_miller@partner.nps.gov>
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC45011

Hi all,

I phoned the spa, and the voice message states that they are closed for annual maintenance January 1 through January 10.

I also posted an Epi-X, to see if there have been any additional cases.

I'm working on contacting the Superintendent of the park to make her aware.

This investigation/response will be complicated by the government shutdown.

Laura, would it be possible to talk tomorrow about appropriate next steps? An environmental assessment was done back in July. I'd be interested to hear your thoughts on environmental testing.

Thank you!

Maria

On Thu, Jan 3, 2019 at 5:00 PM Said, Maria <maria_said@nps.gov> wrote:

Hi Sooji,

Thanks for letting us know about this. From Google maps, it looks like the address the first case (135 Central Avenue) gave is a building outside the park. However, if they named the Quapaw Baths & Spa specifically, I assume that is where they visited. It is concerning that this is the second case linked to the spa in the last 6 months.

The National Park Service is closed with the government shutdown, although some parks are continuing to operate. I will look into the situation at Hot Springs National Park to see if they are running, and if so, at what capacity.

Cat, have you had any clusters linked with any hotels in non-park land? It looks like these two patients stayed at different hotels.

Thanks.

Maria

On Thu, Jan 3, 2019 at 4:01 PM Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov> wrote:

Dear Colleague(s):

Please see the attached notification regarding a case of Legionnaires' disease that may be travel-associated.

This case, (b)(6) used the hot tub at Quapaw Baths & Spa in Hot Springs National Park, with the address "413 Central Ave." There was another case in the past year, (b)(6) (attached), who used the hot tub at Quapaw, Hot Springs National Park as well. However, for (b)(6) the address is written as (b)(6) I was wondering if updated information may be available for (b)(6) related to the patient's hot tub use?

Thanks.

Sooji Lee, MS, MSPH
Epidemiologist (HRC, Inc.)
Legionella Team (NC RD/D3D/RDB)
Centers for Disease Control and Prevention
1600 Clifton Road, MS H-24-6 Atlanta, GA 30329
Phone: 404 718 3197 | Email: slee7@cdc.gov

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

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From: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
Sent: Fri, 4 Jan 2019 15:07:20 +0000
To: Dirk Haselow
Cc: Safi, Haytham (CDC arkansas.gov);Brandi Stricklin;Mike Cima, PhD;Cat Waters;Debbie Pledger;Wheeler, Gary (CDC arkansas.gov)
Subject: RE: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis [REDACTED]

Hello Dirk,

The best contact for TX is:

Hailey Rucas, MPH
Epidemiologist II - Invasive and Respiratory Infectious Disease Team
Emerging and Acute Infectious Disease Branch
Texas Department of State Health Services
(512) 776-6358 phone
(512) 776-7616 fax
Hailey.rucas@dshs.texas.gov

Please reference TX state ID [REDACTED] for this case.

We will update our distribution list.

Best,
Sooji

From: Dirk Haselow <Dirk.Haselow@arkansas.gov>
Sent: Friday, January 4, 2019 10:01 AM
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Cc: Safi, Haytham (CDC arkansas.gov) <haytham.safi@arkansas.gov>; Brandi Stricklin <Brandi.Stricklin@arkansas.gov>; Mike Cima, PhD <Michael.Cima@arkansas.gov>; Cat Waters <Catherine.Waters@arkansas.gov>; Debbie Pledger <Debbie.Pledger@arkansas.gov>; Wheeler, Gary (CDC arkansas.gov) <gary.wheeler@arkansas.gov>
Subject: FW: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis [REDACTED]

Hi Sooji!

I just learned of this last night. Can you share contact information for the patient and the relevant TX jurisdiction. We'd like to get our hands on the case investigation form and interview data.

We also determined that we need to add a couple more people to your notification list beyond Cat and Debbie. Please add me, Haytham, Brandi, and Mike, all CC'd, for future notifications.

Thank you so much

Dirk

From: Said, Maria [mailto:maria_said@nps.gov]
Sent: Friday, January 4, 2019 8:35 AM
To: Dirk Haselow <Dirk.Haselow@arkansas.gov>
Subject: Fwd: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC45011

----- Forwarded message -----

From: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Date: Thu, Jan 3, 2019 at 4:01 PM
Subject: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis (b)(6)
To: CATHERINE.WATERS@ARKANSAS.GOV <CATHERINE.WATERS@arkansas.gov>, Debbie.Pledger@arkansas.gov <Debbie.Pledger@arkansas.gov>, maria_said@nps.gov <maria_said@nps.gov>
Cc: NCID DBMD Travel-Legionella (CDC) <travellegionella@cdc.gov>

Dear Colleague(s):

Please see the attached notification regarding a case of Legionnaires' disease that may be travel-associated.

This case, (b)(6) used the hot tub at Quapaw Baths & Spa in Hot Springs National Park, with the address "413 Central Ave." There was another case in the past year, (b)(6) (attached), who used the hot tub at Quapaw, Hot Springs National Park as well. However, for (b)(6) the address is written as (b)(6) I was wondering if updated information may be available for (b)(6) related to the patient's hot tub use?

Thanks.

Sooji Lee, MS, MSPH
Epidemiologist (IHRG, Inc.)
Legionella Team (NCIRD/DBD/RD3)
Centers for Disease Control and Prevention

1600 Clifton Road, MS 124-6 Atlanta, GA 30333
Phone: 404-718-3192 | Email: slee7@cdc.gov

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Said, Maria
Sent: Fri, 4 Jan 2019 09:19:39 -0500
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC45011

Hi Sooji,

I looked at the case report form for 37173. It clearly says that the person stayed at the Quapaw Spa. I don't see any address of 135 Central Ave on the report form.

We are moving forward as if this person visited the Quapaw Spa, even though the 135 Central Ave address is different. Please let me know if you see this as an issue or if there are any additional reasons to think that the person did not visit the Quapaw.

Thanks.

Maria

On Thu, Jan 3, 2019 at 4:01 PM Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov> wrote:

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Please see the attached notification regarding a case of Legionnaires' disease that may be travel-associated.

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Thanks.

Sooji Lee, MS, MSPH

Epidemiologist (IHRC, Inc.)

Legionella Team (NCIRD/DBD/BD3)

Centers for Disease Control and Prevention

1600 Clifton Road, MS -24 6 Atlanta, GA 30329

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Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
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Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Google Calendar on behalf of maria_said@nps.gov
Sent: Fri, 4 Jan 2019 16:03:12 +0000
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
Subject: Accepted: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis ... @ Fri Jan 4, 2019 12pm - 1pm (EST) (Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR))
Attachments: invite.ics

maria_said@nps.gov has accepted this invitation.

[EXTERNAL] CONFIDENTIAL: travel-associated legionellosis (b)(6)

Fri Jan 4, 2019 12pm – 1pm

Skype Meeting ([map](#))

Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)

- Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
- maria_said@nps.gov
- Haselow, Dirk (CDC arkansas.gov)
- Smith, Jessica (CDC/DDID/NCIRD/DBD)
- Lauren Miller
- Cat Waters
- Sara Newman
- Debbie Pledger
- Justin Cully
- David Kostamo

Please see call information below! – Sooji

.....
Join Skype Meeting

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Join by phone

(404) 553-8912 (Atlanta Dial-in Conference Region) English (United States)

(855) 348-8390 (Atlanta Dial-in Conference Region) English (United States)

Find a local number

Conference ID: (b)(6)

Forgot your dial-in PIN? |Help

[!OC([1033])!]

From: Dirk Haselow >

Sent: Friday, January 4, 2019 10:48 AM

To: 'Said, Maria' >

Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) >; Cat Waters >; Debbie Pledger >; NCID DBMD Travel-Legionella (CDC) >; David Kostamo >; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) >; Lauren Miller >; Justin Cully >; Sara Newman >

Subject: RE: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis

(b)(6)

That time works for me.

Fyi, to address your previous question to cat. We have a single other legionella case in the last 6 months other than the two you have associated with the park. That case was nowhere near hot springs

Dirk

From: Said, Maria [mailto:maria_said@nps.gov]

Sent: Friday, January 4, 2019 9:45 AM

To: Dirk Haselow >

Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) >; Cat Waters >; Debbie Pledger >; NCID DBMD Travel-Legionella (CDC) >; David Kostamo >; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) >; Lauren Miller >; Justin Cully >; Sara Newman >

Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC45011

Thanks Dirk. Are you available to join a call with CDC? Sooji, I am available whenever.

Can we aim for 12 noon Eastern Time?

I am including on this email Justin Cooly, the Chief Ranger for the park.

Maria

On Fri, Jan 4, 2019 at 10:41 AM Dirk Haselow > wrote:

Hi Maria,

I just briefed my director, Dr. Nate Smith, on this situation and he fully supports your suggestion of notifying customers. If that cannot be done quickly, he has directed me to proceed with public notification.

Respectfully,

Dirk

From: Said, Maria [mailto:maria_said@nps.gov]

Sent: Friday, January 4, 2019 8:45 AM

To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) >

Cc: Cat Waters >; Debbie Pledger >; NCID DBMD Travel-Legionella (CDC) >; David Kostamo >; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) >; Lauren Miller >; Dirk Haselow >

Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC45011

Thanks Sooji.

I just got off the phone with Dirk Haselow, the state epi in Arkansas. I would certainly be open to a call. I am cc'ing Dirk here too.

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On Fri, Jan 4, 2019 at 9:39 AM Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) > wrote:

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Many thanks,

Sooji

From: Said, Maria >

Sent: Thursday, January 3, 2019 5:41 PM

To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) >

Cc: CATHERINE.WATERS@ARKANSAS.GOV; Debbie.Pledger@arkansas.gov; NCID DBMD Travel-Legionella (CDC) >; David Kostamo >; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) >; Lauren Miller >

Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis (b)(6)

Hi all,

I phoned the spa, and the voice message states that they are closed for annual maintenance January 1 through January 10.

I also posted an Epi-X, to see if there have been any additional cases.

I'm working on contacting the Superintendent of the park to make her aware.

This investigation/response will be complicated by the government shutdown.

Laura, would it be possible to talk tomorrow about appropriate next steps? An environmental assessment was done back in July. I'd be interested to hear your thoughts on environmental testing.

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On Thu, Jan 3, 2019 at 5:00 PM Said, Maria > wrote:

Hi Sooji,

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Cat, have you had any clusters linked with any hotels in non-park land? It looks like these two patients stayed at different hotels.

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Thanks.

—

Sooji Lee, MS, MSPH

Epidemiologist (IHRC, Inc.)

Legionella Team (NCIRD/DBD/RDB)

Centers for Disease Control and Prevention

1600 Clifton Road, MS H24-6 | Atlanta, GA 30329

Phone: 404-718-3192 | •: slee7@cdc.gov

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Maria Said, MD, MHS | CDR, U.S. Public Health Service

Epidemiology Branch Chief | Office of Public Health | National Park Serv

[Google Calendar](#)

[Learn More](#)

From: Said, Maria
Sent: Fri, 4 Jan 2019 11:04:05 -0500
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC45011

Thank you Sooji. Much appreciated.
Maria

On Fri, Jan 4, 2019 at 10:59 AM Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov> wrote:

Please see call information below! – Sooji

Join Skype Meeting

Trouble Joining? [Try Skype Web App](#)

Join by phone

[\(404\) 553-8912](#) (Atlanta Dial-in Conference Region) English (United States)

[\(855\) 348-8390](#) (Atlanta Dial-in Conference Region) English (United States)

[Find a local number](#)

Conference ID:

[Forgot your dial-in PIN?](#) | [Help](#)

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To: 'Said, Maria' <maria_said@nps.gov>
Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Cat Waters <Catherine.Waters@arkansas.gov>; Debbie Pledger <Debbie.Pledger@arkansas.gov>; NCID DBMD Travel-Legionella (CDC) <travellegionella@cdc.gov>; David Kostamo <david_kostamo@nps.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Lauren Miller <lauren_miller@partner.nps.gov>; Justin Cully <justin_cully@nps.gov>; Sara Newman <sara_newman@nps.gov>
Subject: RE: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis (b)(6)

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Dirk

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To: Dirk Haselow <Dirk.Haselow@arkansas.gov>
Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Cat Waters <Catherine.Waters@arkansas.gov>; Debbie Pledger <Debbie.Pledger@arkansas.gov>; NCID DBMD Travel-Legionella (CDC) <travellegionella@cdc.gov>; David Kostamo <david_kostamo@nps.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Lauren Miller <lauren_miller@partner.nps.gov>; Justin Cully <justin_cully@nps.gov>; Sara Newman <sara_newman@nps.gov>
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC45011

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I am including on this email Justin Cooly, the Chief Ranger for the park.

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Respectfully,

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From: Said, Maria [mailto:maria_said@nps.gov]
Sent: Friday, January 4, 2019 8:45 AM
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Cc: Cat Waters <Catherine.Waters@arkansas.gov>; Debbie Pledger <Debbie.Pledger@arkansas.gov>; NCID DBMD Travel-Legionella (CDC) <travellegionella@cdc.gov>; David Kostamo <david_kostamo@nps.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Lauren Miller <lauren_miller@partner.nps.gov>; Dirk Haselow <Dirk.Haselow@arkansas.gov>
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC45011

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Sent: Thursday, January 3, 2019 5:41 PM

To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>

Cc: CATHERINE.WATERS@ARKANSAS.GOV; Debbie.Pledger@arkansas.gov; NCID DBMD Travel- Legionella (CDC) <travellegionella@cdc.gov>; David Kostamo <david_kostamo@nps.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Lauren Miller <lauren_miller@partner.nps.gov>

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Epidemiologist (I-RC, Inc.)

Legionella Team (NCIRD/DBD/ROB)

Centers for Disease Control and Prevention

1600 Clifton Road, MS 1174-b | Atlanta, GA 30329

Phone: 404-718-3192 | Email: slee7@cdc.gov

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240

Office Tel: 202-513-7151 | Email: maria_said@nps.gov

Website (public): <https://www.nps.gov/orgs/1878/index.htm>

Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

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From: Google Calendar on behalf of justin_cully@nps.gov
Sent: Fri, 4 Jan 2019 16:33:03 +0000
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
Subject: Accepted: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis ... @ Fri Jan 4, 2019 11am - 12pm (CST) (Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR))
Attachments: invite.ics

justin_cully@nps.gov has accepted this invitation.

[EXTERNAL] CONFIDENTIAL: travel-associated legionellosis

(b)(6)

Fri Jan 4, 2019 11am – 12pm

Skype Meeting ([map](#))

Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)

- Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
- justin_cully@nps.gov
- Haselow, Dirk (CDC arkansas.gov)
- 'Said, Maria'
- Smith, Jessica (CDC/DDID/NCIRD/DBD)
- Debbie Pledger
- Cat Waters
- David Kostamo
- Lauren Miller
- Sara Newman

Please see call information below! – Sooji

Join Skype Meeting

Trouble Joining? Try Skype Web App

Join by phone

(404) 553-8912 (Atlanta Dial-in Conference Region) English (United States)

(855) 348-8390 (Atlanta Dial-in Conference Region) English (United States)

Find a local number

Conference ID: (b)(6)

Forgot your dial-in PIN? |Help

[!OC([1033])!]

From: Dirk Haselow >

Sent: Friday, January 4, 2019 10:48 AM

To: 'Said, Maria' >

Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) >; Cat Waters >; Debbie Pledger >; NCID DBMD Travel-Legionella (CDC) >; David Kostamo >; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) >; Lauren Miller >; Justin Cully >; Sara Newman >

Subject: RE: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis (b)(6)

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To: Dirk Haselow >

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Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis

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--

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Epidemiology Branch Chief | Office of Public Health | National Park Serv

[Google Calendar](#)

[Learn More](#)

From: Said, Maria
Sent: Fri, 4 Jan 2019 14:09:56 -0500
To: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Subject: Re: [EXTERNAL] Legionella resources

Thanks Jessica - much appreciated.
Maria

On Fri, Jan 4, 2019 at 2:08 PM Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

Hi all,

As follow-up to the call earlier today, attached and below are the resources I mentioned that may be of help.

The attached word doc is the cooling tower-specific assessment form that we've been using in recent months. I also threw in ASHRAE Standard 188 and Guideline 12, and the CTI guidance and NSF protocols for best practices for *Legionello* control in cooling towers.

Link to CDC environmental investigation resources, including assessment form and sampling procedure/potential sampling sites documents: <https://www.cdc.gov/legionella/health-depts/environmental-inv-resources.html>

Re: the ozone question, the link to EPA document on technologies for Legionella control in premise plumbing: <https://www.epa.gov/ground-water-and-drinking-water/technologies-legionella-control-premise-plumbing-systems>

Link to CDC hot tub disinfection guidance: <https://www.cdc.gov/legionella/downloads/hot-tub-disinfection.pdf>

Thanks and please let us know if there's anything we can do to be of assistance as the investigation continues.

Jessica

Jessica C. Smith, MPH

Epidemiologist | Centers for Disease Control and Prevention

NCIRD/DBD/Respiratory Diseases Branch

404.718.5205 | lyd7@cdc.gov

-----Original Appointment-----

From: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>

Sent: Friday, January 4, 2019 10:59 AM

To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR); Haselow, Dirk (CDC arkansas.gov); 'Said, Maria'; Smith, Jessica (CDC/DDID/NCIRD/DBD)

Cc: Cat Waters; Debbie Pledger; David Kostamo; Lauren Miller; Justin Cully; Sara Newman

Subject: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis (b)(6)

When: Friday, January 4, 2019 12:00 PM-1:00 PM (UTC-05:00) Eastern Time (US & Canada).

Where: Skype Meeting

Please see call information below! – Sooji

Join Skype Meeting

Trouble Joining? [Try Skype Web App](#)

Join by phone

[\(404\) 553-8912](#) (Atlanta Dial-in Conference Region)

English (United States)

[\(855\) 348-8390](#) (Atlanta Dial-in Conference Region)

English (United States)

[Find a local number](#)

Conference ID: (b)(6)

[Forgot your dial-in PIN?](#) | [Help](#)

From: Dirk Haselow <Dirk.Haselow@arkansas.gov>
Sent: Friday, January 4, 2019 10:48 AM
To: 'Said, Maria' <maria_said@nps.gov>
Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Cat Waters <Catherine.Waters@arkansas.gov>; Debbie Pledger <Debbie.Pledger@arkansas.gov>; NCID DBMD Travel-Legionella (CDC) <travellegionella@cdc.gov>; David Kostamo <david_kostamo@nps.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Lauren Miller <lauren_miller@partner.nps.gov>; Justin Cully <justin_cully@nps.gov>; Sara Newman <sara_newman@nps.gov>
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Sent: Fri, 4 Jan 2019 17:47:23 -0500
To: Said, Maria;Smith, Jessica (CDC/DDID/NCIRD/DBD);Haselow, Dirk (CDC arkansas.gov)
Cc: Justin Cully;Kesteloot, Kurt;Sara Newman;Laura Miller
Subject: RE: Case Report Form review
Attachments: (b)(6).pdf, Legionellosis 1-3-19 AR.docx

Hi Maria,

I can reach out to IL and TX so that they can send their case report forms to you. Typically, I would wait for their permission/acknowledgement, however, in the interest of time, I am copying the case notifications we received. TX and IL may have additional information/more completed case report form.

Best,
Sooji

From: Said, Maria <maria_said@nps.gov>
Sent: Friday, January 4, 2019 5:41 PM
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Haselow, Dirk (CDC arkansas.gov) <dirk.haselow@arkansas.gov>
Cc: Justin Cully <justin_cully@nps.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>; Sara Newman <sara_newman@nps.gov>; Laura Miller <laura_a_miller@nps.gov>
Subject: Case Report Form review

Hi Sooji, Jessica, and Dirk,

I'd like to review the full 2 case report forms before we start guest notifications.

I know Dirk is working on getting them (thank you Dirk), but he may not have the most recent one, as it is a TX case and we were all notified about it just yesterday.

Sooji and Jessica, are you able to contact TX and IL to help us see these case report forms?

I'm happy to hear anyone's thoughts and the best way forward.

Thanks.
Maria

Legionellosis - Legionnaires Disease - L. pneumophila serogroup 1 Case Report

[Demographic](#) | [General Illness](#) | [Symptoms](#) | [Laboratory Tests](#) | [Symptomatic Contacts](#) | [Exposure History](#) | [Home Information](#) | [Epidemiologic Data](#) | [Reporting Source](#) | [View Logs](#)

State Case Number: (b)(6)

+ [Demographic](#)

- [General Illness](#)

Disease/Onset Date: 07/27/2018
Diagnosis Date: 08/02/2018
Date patient sought initial medical evaluation: 07/29/2018
Location where first seen: Emergency Department
Patient's Physician:
Physician's Phone Number:
Other Physician:
Was the patient seen in an emergency department? Yes
ER Hospital: Northwest Community Hospital
 Arlington Heights, IL
 (847) 618-1000
Other ER Hospital:
Was the patient admitted to a hospital? Yes
Was the hospital admitted to the same as ER Hospital? Yes
Hospital: Northwest Community Hospital
 Arlington Heights, IL
 (847) 618-1000
Other Hospital:
Admission Date: 07/29/2018
Discharge Date: 08/03/2018
Duration of Stay: 5
Is the patient pregnant? No
Estimated Due Date:
Estimated Due Date was calculated based on:
If the patient died, did the patient die due to the disease or condition under investigation?
Age at Onset: [REDACTED]
Address at Onset: [REDACTED]

- Symptoms

Fever: Yes
Highest Fever, if one exists: 103 °F
Diarrhea (3 or more loose or watery stools in 24 hours): No
Cough: Yes
Headache: No
Myalgia: No
Shortness of Breath: Yes
Pneumonia (clinical diagnosis): Yes
Pneumonia (radiographically consistent w/ Pneumonia): Yes
Was the patient immunocompromised? No
Was the patient treated in the ICU? No

- Laboratory Tests

Were human laboratory tests conducted? Yes

- Edit

Collection Date	Specimen Source	Laboratory
07/31/2018	Not Specified	Mayo Clinic Laboratory On First, Dept Of Lab Med And Pathology

Specimen Number: (b)(6)
Specimen Source: Not Specified
Other:
ELR Specimen Source:
Other: SPUTUM -
Specimen Collection Date: 07/31/2018
Laboratory: Mayo Clinic Laboratory On First, Dept Of Lab Med And Pathology
Other:
Ordering Facility Name: Northwest Comm Hlth Care
Ordering Facility Address: 800 W Central Rd
Arlington Heights, IL 60005
Ordering Facility Phone: (847) 618-6076
Ordering Provider Name: Patricia M Stringer
Ordering Provider Phone:
Reason for Study:

- Edit Lab Results

Test Type	Test Result
Legionella sp DNA	Positive

Lab Report Date: 08/02/2018
Test Type: Legionella sp DNA
Other:

Test Method: Probe.Amplification.Target
Other:
Test Result: Positive
Other:
Reference Range:

Comment:

PCR POSITIVITY MAY BE DUE TO LEGIONELLA INFECTION OR ENVIRONMENTAL/WATER LEGIONELLA DNA IN PATIENT SPECIMEN. SEMI-URGENT RESULT. THIS TEST WAS DEVELOPED AND ITS PERFORMANCE CHARACTERISTICS DETERMINED BY MAYO CLINIC IN A MANNER CONSISTENT WITH CLIA REQUIREMENTS. THIS TEST HAS NOT BEEN CLEARED OR APPROVED BY THE U.S. FOOD AND DRUG ADMINISTRATION.

- Symptomatic Contacts

Does the patient know anyone with similar symptoms? No

Name:**Alias Name:****DOB:****Current Age:****Sex:****Ethnicity:****Races:****Home Phone:****Work Phone:****Cell Phone:****Address Type:****Address Line 1:****Address Line 2:****City:****County:****State:****Zip:****Country:****Relationship to Case:****If other, specify:**

Did the contact have symptoms consistent with Legionellosis?

Onset Date: (mm/dd/ccyy)

Contact Occupation:

Restricted?

Immunization referrals for contact?

Contact Comment:

- [Exposure History](#)

- **Have exposure to water (hot tubs, pools, recreational water, misters, fountains, away from home showers)?** Yes

- [Edit](#)

Potential Source	Reason for Exposure	First Exposure Date	Last Exposure Date
Other	Visitor	07/19/2018	07/19/2018

Potential Source of Exposure:

If other, specify:

Reason for Exposure:

If other, specify:

Date of First Exposure: (mm/dd/ccyy)

Date of Last Exposure: (mm/dd/ccyy)

Name:

Address:

City:

State:

Country:

Take a shower:

Use a humidifier:

Use or walk by a whirlpool/spa:

Use or walk by a pool or water park:

Spend any time near a decorative fountain:

Have exposure to aerosolized water or mist:

Comment:

- [Edit](#)

Potential Source	Reason for Exposure	First Exposure Date	Last Exposure Date
Hotel/Motel/Inn	Visitor	07/20/2018	07/22/2018

Potential Source of Exposure:

If other, specify:

Reason for Exposure:

If other, specify:

Date of First Exposure: (mm/dd/ccyy)

Date of Last Exposure: (mm/dd/ccyy)

Name:

Address:

Other
 Bath House
 Visitor
 07/19/2018
 07/19/2018
 (b)(6)
 (b)(6)
 Hot Springs National Park
 Arkansas
 United States
 Yes
 No
 Yes
 No
 No
 Yes
 Stated She Was In Tub For 25 Minutes.

Hotel/Motel/Inn
 Visitor
 07/20/2018
 07/22/2018

(b)(6)

City: Hot Springs
State: Arkansas
Country: United States
Take a shower: Yes
Use a humidifier: No
Use or walk by a whirlpool/spa: No
Use or walk by a pool or water park: No
Spend any time near a decorative fountain: No
Have exposure to aerosolized water or mist: Yes

Comment:

- [Edit](#)

Potential Source	Reason for Exposure	First Exposure Date	Last Exposure Date
Hotel/Motel/Inn	Visitor	07/17/2018	07/20/2018

Potential Source of Exposure: Hotel/Motel/Inn

If other, specify:

Reason for Exposure: Visitor

If other, specify:

Date of First Exposure: (mm/dd/ccyy) 07/17/2018

Date of Last Exposure: (mm/dd/ccyy) 07/20/2018

Name:

Address:

City:

State:

Country:

Take a shower:

Use a humidifier:

Use or walk by a whirlpool/spa:

Use or walk by a pool or water park:

Spend any time near a decorative fountain:

Have exposure to aerosolized water or mist:

(b)(6)

Arkansas
United States

Yes
No
No
No
No
Yes

Comment:

- [Hotel Information](#)

Did the patient stay overnight at a hotel? Yes

- [Edit](#)

Hotel	Date Checked In	Date Checked Out
(b)(6)		

Hotel Name:

Address:

City:

State:

Country:

(b)(6)

Hot Springs Village
Arkansas
United States

Date Checked In: (mm/dd/ccyy) 07/17/2018
Date Checked Out: (mm/dd/ccyy) 07/20/2018
Hotel Room Number: (b)(6)

- [Edit](#)

Hotel	Date Checked In	Date Checked Out
(b)(6)	07/20/2018	07/22/2018

Hotel Name: (b)(6)
Address: (b)(6)
City: Hot Springs
State: Arkansas
Country: United States
Date Checked In: (mm/dd/ccyy) 07/20/2018
Date Checked Out: (mm/dd/ccyy) 07/22/2018
Hotel Room Number: (b)(6)

- [Epidemiologic Data](#)

Case Opened Date: 08/03/2018
Case Status: Not A Case
Date Last Changed: 08/07/2018
Is case part of an outbreak?
Outbreak ID:
Occupation:
Other Occupation:
Name of Employer:
Employer Address:
Employer City:
Employer State:
Patient attends/resides in:
Other Facility:
Day Care / Facility Name:
Date Investigation Initiated: 08/03/2018
Date Patient/Proxy interview completed to answer the I-NEDSS module questions: 08/03/2018
Were referrals made as appropriate for services and/or treatment? Yes
Was educational information provided on disease containment? Yes
Has the patient smoked in the last year? Yes
 If yes, for how many years? 30
Was the patient a former smoker? No
 If yes, for how many years?
Has the patient received an organ transplant? No
Use any respiratory therapy devices (e.g., nebulizers or CPAP)? No
 Does this device use a humidifier or misty water?

How is it cleaned?

Date of First Exposure: (mm/dd/ccyy)

Date of Last Exposure: (mm/dd/ccyy)

Do you recall any general construction, plumbing projects, water main breaks or water line work either at your home or while traveling in those days? No

If yes, please describe the type of work and location:

Did you shop at a grocery store where there were mister machines for fruits and vegetables? No

If yes, please supply the name of the store and location:

What is your home water source? Municipal

If Municipal, from what Company:

Was this case associated with a healthcare exposure? No

Was a health care exposure investigation initiated?

Date HCA Investigation Initiated: (mm/dd/ccyy)

If yes, select all measures implemented:

Has out-of-state travel information been sent to CDC? Yes

Epi Comment: PMH: hypothyroidism & smoking abuse (1.5 ppd x 30 years). Onset 7.27.18 sluggishness. Onset 7.28.18 fever (103F), chills, sweats, productive cough minimal clear sputum, wheezing & SOB->ARD requiring O2 via NC. On admission CXR + RUL/RLL & LLL PNA. ARF. Labs + leukocytosis (15), hyponatremia (131), hypokalemia (3.3) & transaminitis (AST 116, ALT 75). Multiple possible exposures (please see exposure section).

- Reporting Source

Earliest Report Date: 08/02/2018

Date LHD Received: 08/03/2018

Reporter Name:

Reporter Phone:

Reporter Comment:

Reporting Organization Type: Lab - Private

Reporting Organization Name: Mayo Clinic Laboratory - First Street

Address Line 1: 200 First Street Southwest

Address Line 2:

City: Rochester

County: Out Of State

State: Minnesota
Zip: 55905-0001
Country: United States

**If Reporting Organization not found,
enter information here:**

- [View Logs](#)

User

Comments:

Case Activity: August 6, 2018 12:50:11 PM, TPADOVAN: Case Opened by user August 6, 2018 12:50:17 PM, TPADOVAN: Investigator assignment changed to PADOVANI, THOMAS August 6, 2018 12:50:17 PM, TPADOVAN: Investigation status changed to in-progress August 6, 2018 12:54:38 PM, TPADOVAN: Diagnosis was changed from Legionellosis - Legionnaires Disease to Legionellosis - Legionnaires Disease - L. pneumophila serogroup 1 August 6, 2018 1:09:46 PM, TPADOVAN: Case status changed to 'Confirmed'. August 7, 2018 8:38:36 AM, TPADOVAN: Case status changed to 'Not A Case'.

Report

Logs:

August 3, 2018 8:12:09 AM, TPADOVAN: Report reviewed by user

ELR Logs:

August 3, 2018 5:05:29 AM, ELRIMPORT: Imported from ELR: 24D0404292, 2018-08-03 01:09:06.0, 20180803003448754314

Date: 01/03/2019

To: Sooji Lee, Centers for Disease Control and Prevention;
CDC Legionella team.

From: Hailey Rucas, Texas Department of State Health Services, Austin, TX, USA

RE: Notification of a single case of Legionnaires' disease

The Texas Department of State Health Services has been informed of a confirmed case of Legionnaires' disease in a (b)(6) year-old female resident of TX (State ID: (b)(6)) whose illness may be associated with travel away from home. The reported date of onset was 11/23/2018 and the patient recovered.

Results of diagnostic testing for Legionella are as follows:

Test	Positive?	Legionella species	Serogroup	Date of test
Urine Antigen	YES	pneumophila	1	11/25/2018

Patient travel information:

The patient reported travel to:

1. Hotel Information:

(b)(6)

Room number:

Dates of stay:

Exposures:

No reported exposures other than a shower at the hotel

2. Other exposure:

Quapaw Baths & Spa
413 Central Ave
Hot Springs National Park, AR 71901

Date of visit:

11/16/18

Exposures:

The case reported staying at the hot springs for approximately 2 hours

From: Said, Maria
Sent: Mon, 7 Jan 2019 13:16:16 -0500
To: Haselow, Dirk (CDC arkansas.gov)
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD); Lee, Sooji (CDC/DDID/NCIRD/DBD)
(CTR); Kesteloot, Kurt
Attachments: Legionella_HOSP_Quapaw_Supplemental questionnaire.docx

Dirk,

Please see the attached supplemental questionnaire aimed at better understanding what activities the case patients took part in while they were at the park. I'm happy to hear any suggestions to improve it.

Also, let us know the best way to obtain this information. I can make the calls or defer to you in Arkansas or defer to the health departments in the other states (IL, TX) -- whatever you all think best.

Thanks.
Maria

Legionellosis Supplemental Questionnaire — Hot Springs National Park, AR — January 2019

Patient Name: _____

Sex: M/F

County, State: _____

Zip Code: _____

Date of Birth: ____/____/____

Onset Date: ____/____/____

In the 10 days prior to the onset of your illness:

1. Did you visit the Quapaw Baths & Spa at 413 Central Avenue, Hot Springs National Park, AR 71901?

Yes

No

2. If you were at the spa, did you (please check all that apply):

Take a shower in the spa

Sit in a thermal pool in the spa

Use a private bath in the spa

Sit in the steam cave in the spa

Spend time next to or walk past a fountain in the basement massage area

3. While you were within Hot Springs National Park, did you take part in any other activity that may have exposed you to aerosolized water?

Yes

No

4. If you did take part in another activity that may have exposed you to aerosolized water, please describe the activities:

5. Do you have any additional concerns regarding Legionella exposure that you would like to share?

From: Said, Maria
Sent: Mon, 7 Jan 2019 13:51:01 -0500
To: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Cc: Haselow, Dirk (CDC arkansas.gov); Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR); Kesteloot, Kurt
Subject: Re: [EXTERNAL] RE:
Attachments: Legionella_HOSP_Quapaw_Supplemental questionnaire.V2.docx

Thanks Jessica. Yes, we can certainly ask more about that. I've added it to the questionnaire (see Version 2 attached), and because I am not sure if these fountains are in national park or state land, I've made the next question more inclusive to ask about activities both on park land and in the city of Hot Springs, AR. My assumption is that people are probably not aware if they are on park or state land during different activities.

Maria

On Mon, Jan 7, 2019 at 1:43 PM Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

Hi Maria,

I know this wasn't directed at CDC but just thought I'd ask... since the case report form that Texas just

(b)(5)

(b)(5)

Thanks,
Jessica

From: Said, Maria <maria_said@nps.gov>
Sent: Monday, January 7, 2019 1:16 PM
To: Haselow, Dirk (CDC arkansas.gov) <dirk.haselow@arkansas.gov>
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Subject:

Dirk,

Please see the attached supplemental questionnaire aimed at better understanding what activities the case patients took part in while they were at the park. I'm happy to hear any suggestions to improve it.

Also, let us know the best way to obtain this information. I can make the calls or defer to you in Arkansas or defer to the health departments in the other states (IL, TX) -- whatever you all think best.

Thanks.

Maria

--

Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

Legionellosis Supplemental Questionnaire — Hot Springs National Park, AR — January 2019

Patient Name: _____

Sex: M/F

County, State: _____

Zip Code: _____

Date of Birth: ___/___/_____

Onset Date: ___/___/_____

In the 10 days prior to the onset of your illness:

1. Did you visit the Quapaw Baths & Spa at 413 Central Avenue, Hot Springs National Park, AR 71901?

Yes

No

2. If you were at the spa, did you (please check all that apply):

Take a shower in the spa

Sit in a thermal pool in the spa

Use a private bath in the spa

Sit in the steam cave in the spa

Spend time next to or walk past a fountain in the basement massage area

3. While you were in Hot Springs, AR, did you walk next to or spend time around any decorative fountains?

Yes

No

If so, where? _____

4. While you were in Hot Springs, AR, and Hot Springs National Park did you take part in any other activity that may have exposed you to aerosolized water?

Yes

No

5. If you did take part in another activity that may have exposed you to aerosolized water, please describe the activities:

6. Do you have any additional concerns regarding Legionella exposure that you would like to share?

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Sent: Fri, 4 Jan 2019 19:06:34 +0000
To: Haselow, Dirk (CDC arkansas.gov); 'Said, Maria'; Cat Waters; Debbie Pledger; David Kostamo; Lauren Miller; Justin Cully; Sara Newman
Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
Subject: Legionella resources
Attachments: Cooling Tower EH Assesstment Form.docx, CTI legionellosis guideline.pdf, NSF P453-2017 - Cooling Tower Water Systems - Treatment Operation and Ma....pdf, ASHRAE standard 188-2015.pdf, ASHRAE guideline 12-2000.pdf

Hi all,

As follow-up to the call earlier today, attached and below are the resources I mentioned that may be of help.

The attached word doc is the cooling tower-specific assessment form that we've been using in recent months. I also threw in ASHRAE Standard 188 and Guideline 12, and the CTI guidance and NSF protocols for best practices for *Legionella* control in cooling towers.

Link to CDC environmental investigation resources, including assessment form and sampling procedure/potential sampling sites documents: <https://www.cdc.gov/legionella/health-depts/environmental-inv-resources.html>

Re: the ozone question, the link to EPA document on technologies for Legionella control in premise plumbing: <https://www.epa.gov/ground-water-and-drinking-water/technologies-legionella-control-premise-plumbing-systems>

Link to CDC hot tub disinfection guidance: <https://www.cdc.gov/legionella/downloads/hot-tub-disinfection.pdf>

Thanks and please let us know if there's anything we can do to be of assistance as the investigation continues.

Jessica

—

Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NCIRD/DBD/Respiratory Diseases Branch
404.718.5205 | lyd7@cdc.gov

-----Original Appointment-----

From: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Sent: Friday, January 4, 2019 10:59 AM
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR); Haselow, Dirk (CDC arkansas.gov); 'Said, Maria'; Smith, Jessica (CDC/DDID/NCIRD/DBD)
Cc: Cat Waters; Debbie Pledger; David Kostamo; Lauren Miller; Justin Cully; Sara Newman

Subject: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis (b)(6)
When: Friday, January 4, 2019 12:00 PM-1:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Skype Meeting

Please see call information below! – Sooji

Join Skype Meeting

[Trouble Joining? Try Skype Web App](#)

Join by phone

(404) 553-8912 (Atlanta Dial-in Conference Region) English (United States)
(855) 348-8390 (Atlanta Dial-in Conference Region) English (United States)

[Find a local number](#)

Conference ID: (b)(6)

[Forgot your dial-in PIN?](#) | [Help](#)

From: Dirk Haselow <Dirk.Haselow@arkansas.gov>
Sent: Friday, January 4, 2019 10:48 AM
To: 'Said, Maria' <maria_said@nps.gov>
Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Cat Waters <Catherine.Waters@arkansas.gov>; Debbie Pledger <Debbie.Pledger@arkansas.gov>; NCID DBMD Travel-Legionella (CDC) <travellegionella@cdc.gov>; David Kostamo <david_kostamo@nps.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Lauren Miller <lauren_miller@partner.nps.gov>; Justin Cully <justin_cully@nps.gov>; Sara Newman <sara_newman@nps.gov>
Subject: RE: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis (b)(6)

That time works for me.

Fyi, to address your previous question to cat. We have a single other legionella case in the last 6 months other than the two you have associated with the park. That case was nowhere near hot springs

Dirk

From: Said, Maria [mailto:maria_said@nps.gov]
Sent: Friday, January 4, 2019 9:45 AM
To: Dirk Haselow <Dirk.Haselow@arkansas.gov>
Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Cat Waters <Catherine.Waters@arkansas.gov>; Debbie Pledger <Debbie.Pledger@arkansas.gov>; NCID DBMD Travel-Legionella (CDC) <travellegionella@cdc.gov>; David Kostamo <david_kostamo@nps.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Lauren Miller <lauren_miller@partner.nps.gov>; Justin Cully <justin_cully@nps.gov>; Sara Newman <sara_newman@nps.gov>
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC45011

Thanks Dirk. Are you available to join a call with CDC? Sooji, I am available whenever. Can we aim for 12 noon Eastern Time? I am including on this email Justin Cooley, the Chief Ranger for the park.

Maria

On Fri, Jan 4, 2019 at 10:41 AM Dirk Haselow <Dirk.Haselow@arkansas.gov> wrote:

Hi Maria,

I just briefed my director, Dr. Nate Smith, on this situation and he fully supports your suggestion of notifying customers. If that cannot be done quickly, he has directed me to proceed with public notification.

Respectfully,

Dirk

From: Said, Maria [mailto:maria_said@nps.gov]
Sent: Friday, January 4, 2019 8:45 AM
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Cc: Cat Waters <Catherine.Waters@arkansas.gov>; Debbie Pledger <Debbie.Pledger@arkansas.gov>; NCID DBMD Travel-Legionella (CDC) <travellegionella@cdc.gov>; David Kostamo <david_kostamo@nps.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Lauren Miller <lauren_miller@partner.nps.gov>; Dirk Haselow <Dirk.Haselow@arkansas.gov>
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC45011

Thanks Sooji.

I just got off the phone with Dirk Haselow, the state epi in Arkansas. I would certainly be open to a call. I am cc'ing Dirk here too.

Maria

On Fri, Jan 4, 2019 at 9:39 AM Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov> wrote:

Hi Maria,

Laura is out of the office, but we can certainly have a call today. We are pretty flexible – please let us know what time works best on your end.

Would anyone from Arkansas be available also for the call?

Many thanks,
Sooji

From: Said, Maria <maria_said@nps.gov>
Sent: Thursday, January 3, 2019 5:41 PM
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Cc: CATHERINE.WATERS@ARKANSAS.GOV; Debbie.Pledger@arkansas.gov; NCID DBMD Travel-
Legionella (CDC) <travellegionella@cdc.gov>; David Kostamo <david_kostamo@nps.gov>; Cooley,
Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Lauren Miller
<lauren_miller@partner.nps.gov>
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC45011

Hi all,

I phoned the spa, and the voice message states that they are closed for annual maintenance January 1 through January 10.

I also posted an Epi-X, to see if there have been any additional cases.

I'm working on contacting the Superintendent of the park to make her aware.

This investigation/response will be complicated by the government shutdown.

Laura, would it be possible to talk tomorrow about appropriate next steps? An environmental assessment was done back in July. I'd be interested to hear your thoughts on environmental testing.

Thank you!

Maria

On Thu, Jan 3, 2019 at 5:00 PM Said, Maria <maria_said@nps.gov> wrote:

Hi Sooji,

Thanks for letting us know about this. From Google maps, it looks like the address the first case (b)(6) gave is a building outside the park. However, if they named the Quapaw Baths & Spa specifically, I assume that is where they visited. It is concerning that this is the second case linked to the spa in the last 6 months.

The National Park Service is closed with the government shutdown, although some parks are continuing to operate. I will look into the situation at Hot Springs National Park to see if they are running, and if so, at what capacity.

Cat, have you had any clusters linked with any hotels in non-park land? It looks like these two patients stayed at different hotels.

Thanks.
Maria

On Thu, Jan 3, 2019 at 4:01 PM Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
<npf3@cdc.gov> wrote:

Dear Colleague(s):

Please see the attached notification regarding a case of Legionnaires' disease that may be travel-associated.

This case, (b)(6), used the hot tub at Quapaw Baths & Spa in Hot Springs National Park, with the address "413 Central Ave." There was another case in the past year, (b)(6) (attached), who used the hot tub at Quapaw, Hot Springs National Park as well. However, for (b)(6) the address is written as (b)(6). I was wondering if updated information may be available for (b)(6) related to the patient's hot tub use?

Thanks.

—
Sooji Lee, MS, MSPH
Epidemiologist (E-RC, Inc.)
Legionella Team (NCIRD/DBD/RDB)
Centers for Disease Control and Prevention
1600 Clifton Road, NE H24-6 | Atlanta, GA 30329
Phone: 404-718-3192 | Email: slee7@cdc.gov

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

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Cooling Towers and Evaporative Condensers Environmental Assessment Form

Note: It is important to gain an understanding of where the cooling towers are located, how they work, and how they are maintained. Cooling towers are frequently maintained by an outside contractor, and you may need to contact them directly if facility management does not have an in-depth knowledge of these systems. Request copies of the maintenance logs.

Persons completing the assessment:

Name: _____ Organization: _____

Name: _____ Organization: _____

Name: _____ Organization: _____

Date of Assessment: _____

Facility Details:

Facility Name: _____

Facility Address: _____

GPS Coordinates: _____

Building Owner Name: _____ Telephone: _____

E-mail: _____

Party Responsible for Cooling Tower Maintenance: _____

Telephone: _____ E-mail: _____

What services do the maintenance contractor perform and at what frequency?: _____

Person(s) interviewed during assessment:

Name: _____ Job Title: _____

Telephone: _____ E-mail: _____

Name: _____ Job Title: _____

Telephone: _____ E-mail: _____

Additional space for notes:

List all cooling towers and evaporative condensers on the facility premises

Name of Device (e.g., CT 1)	In Operation (Y/N)	Manufacturer	~Age	Location of Device	# of Cells	Drift Eliminators used? (Y/N)	Purpose of towers? (e.g., heating/cooling or industrial process)

Cooling tower disinfection, operation and maintenance characteristics

1. Name of device from above: _____
2. What is the source of the water for the cooling tower? (e.g., municipal) _____

3. Disinfectant used in cooling tower (Y/N) _____
4. If yes, what type of biocide used, Oxidizing (Y/N) _____ Non-oxidizing (Y/N) _____
5. List name(s) of biocide used (e.g., chlorine, bromine) _____

6. Disinfectant level observed during inspection _____ Date measured _____
7. Range in which the biocide is regularly maintained? (e.g., .5 ppm to 2 ppm) _____

8. Describe the biocide dosing system. Hand fed (Y/N) _____ Automatic dosing by chemical controllers (Y/N) _____
9. Schedule of adding biocide: (e.g., daily, weekly, as needed) _____

10. Are biocide levels monitored (Y/N) ___ How often and by who? _____

11. Scale and/or corrosion inhibitors used (Y/N) _____ Schedule of adding scale and corrosion inhibitors (e.g., daily, weekly, as needed)
12. Is Legionella testing ever performed on the cooling tower (Y/N) ___ How often and by who? _____
13. Is the cooling tower turned off at any time (Y/N) ___ If yes include schedule _____

14. Are there start-up and shut-down procedures for the cooling tower (Y/N) ___ Describe _____

15. Were there any recent (last 6 months) special (non-routine) treatments, maintenance or repairs to the cooling tower (Y/N)___ Date_____ Action taken _____

16. Is the cooling tower ever cleaned (Y/N)___ At what frequency and how?_____

Visual inspection of cooling tower

17. Scale and corrosion observed on cooling tower fill (Y/N)___ Notes_____

18. Biofilm build-up observed on cooling tower fill (Y/N)___ Notes_____

19. Sediment observed in cooling tower basin (Y/N)___ Notes_____

20. Biofilm build-up observed in cooling tower basin (Y/N)___ Notes_____

21. Poor water clarity observed in cooling tower basin (e.g., green, extreme foam) (Y/N)___ Notes_____

Record keeping review

22. Are records available regarding cooling tower operation and maintenance (Y/N)___ Notes_____

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From: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Sent: Wed, 16 Oct 2019 14:13:48 +0000
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
Subject: FW: Hot Springs - Culture results
Attachments: 2019-10-04 - Arkansas Department Of Health - Summary.pdf

Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NCIRD/DBD/Respiratory Diseases Branch
404.718.5705 | lyd7@cdc.gov

From: Said, Maria <maria_said@nps.gov>
Sent: Tuesday, October 15, 2019 10:21 PM
To: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>
Cc: Laura Miller <laura_a_miller@nps.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>; Sara Newman <sara_newman@nps.gov>
Subject: Hot Springs - Culture results

Hi everyone,

We have received results of the Legionella testing at Hot Springs (attached).

Would you all have availability tomorrow to discuss?

We are not sure what to make of the detection in the hot samples (and can see if they have temperature readings from those water samples to see what the temperature actually was). We also are not sure what to make of the TimeZero vs. Standard ISO results.

Thank you as always for your help sorting through this. It is very much appreciated.

Maria



Phigenics
Validation Test®

PHIGENICS ANALYTICAL SERVICES LABORATORY
Phone: 844-850-4087
www.phigenics.com
CDC ELITE Certified

Facility Tested: Arkansas Department Of Health
Date of Testing: 2019/10/04
Contact Email: dostrand@phigenics.com

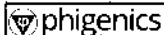
Validation Criteria:
Potable Water - typically in well managed systems, the total viable heterotrophic aerobic bacterial concentration should be less than or equal to 10⁵ CFU/mL. Per the OSHA Legionella Technical Manual, the viable Legionella concentration should be less than 10 CFU/mL unless the water system serves immunocompromised or higher risk users which require a more stringent level of Legionella control (less than 1 CFU/mL).
Utility Water (such as cooling water) - typically in well managed systems, the total viable heterotrophic aerobic bacterial concentration should be less than or equal to 10⁶ CFU/mL. For closed recirculating utility water, the total viable heterotrophic aerobic bacterial concentration should be less than or equal to 10⁵ CFU/mL. Per the OSHA Legionella Technical Manual, the viable Legionella concentration should be less than 10 CFU/mL.
The facility **Water Management Team** should review all options for Validation Criteria and choose its specific criteria based on the specific systems and users.

Phigenics Validation Test PREMIUM Report Summary

Method Used: Next Day Legionella PCR™, TimeZero™, and Standard ISO 11731 Spread Plate

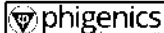
Legionella Caution	<input type="checkbox"/>	Indicates Legionella was detected.
THAB Caution	<input type="checkbox"/>	Indicates total heterotrophic bacteria count exceeds the validation criteria (10 ⁵ for potable, 10 ⁶ for utility, 10 ⁷ for closed recirculating utility).
NO Concern	<input type="checkbox"/> No Shading	Indicates results are better than the validation criteria.
	<input type="checkbox"/> ND	Indicates Legionella was not detected.
	<input type="checkbox"/> P	Indicates results are pending.

PASL Number	Date Inoculated	Date Analyzed	Collector	Location Identification	Category (Potable/Utility)	Molecular Marker Negative Screen	Total Bacteria	TimeZero™			Standard ISO		
								Lpn S1	Lpn S2-14	Legionella Spn	Lpn S1	Lpn S2-14	Legionella Spn
CFU/mL													
349637	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Admin Display Fountain	Potable	Detected	10 ²	ND	ND	ND	<1	<1	<1
349638	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Nobel Fountain	Potable	Not Detected	<100	ND	ND	ND	<1	<1	<1
349639	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Lamar Hot	Potable	Not Detected	<100	ND	ND	ND	<1	<1	<1
349640	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Buckstaff 4th Tub On The Right Hot	Potable	Not Detected	<100	ND	ND	ND	<1	<1	<1
349641	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Buckstaff 4th Tub On The Right Cold	Potable	Not Detected	<100	ND	ND	ND	<1	<1	<1
349642	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Quapaw Hot	Potable	Detected	<100	ND	ND	ND	<1	1	<1
349643	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Quapaw Cold	Potable	Not Detected	<100	ND	ND	ND	<1	<1	<1
349644	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health QE Ind. Tub Hot	Potable	Not Detected	<100	ND	ND	ND	<1	<1	<1
349645	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health QE Ind. Tub Cold	Potable	Detected	<100	ND	ND	ND	<1	<1	<1
349646	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Rm 207 Hale Hot	Potable	Detected	<100	ND	ND	ND	<1	2	<1
349647R	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Rm 207 Hale Cold	Potable	Detected	10 ²	20	ND	ND	<1	<1	1
349648	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Superior Hot	Potable	Not Detected	10 ²	ND	ND	ND	<1	<1	<1
349649	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Rm 2 Arlington Hot	Potable	Detected	10 ²	ND	ND	ND	<1	1	<1
349650	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Rm 2 Arlington Cold	Potable	Detected	10 ²	ND	ND	ND	<1	<1	<1
349651	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Levi Hospital Hot	Potable	Detected	<100	ND	ND	ND	<1	<1	<1
349652	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Cooled Water Reservoir Cold	Potable	Not Detected	10 ²	ND	ND	ND	<1	<1	<1
349653	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Libby Jug Fountain Hot	Potable	Not Detected	<100	ND	ND	ND	<1	<1	<1
349654	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Shell Fountain Hot	Potable	Not Detected	10 ²	ND	ND	ND	<1	<1	<1
349655	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Display Spring Behind Maurice	Utility	Detected	10 ⁵	ND	ND	ND	<10	<10	<10
349656	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Cascade	Potable	Detected	10 ⁵	ND	ND	ND	<1	<1	<1



Disclaimer: Results from the PVT, or from any other analytical protocol for that matter, do not necessarily provide enough evidence to ensure that hazards from pathogenic microorganisms have been eliminated or controlled nor that risk of harm from such hazards has been reduced. Results from the PVT should only be interpreted within the context of properly designed and implemented water management programs. No guarantee regarding results is expressed or implied. THE PVT AND THE RESULTS IT PRODUCES ARE PROVIDED ON AN "AS IS" BASIS. YOU ASSUME TOTAL RESPONSIBILITY AND RISK FOR YOUR USE OF THE PVT AND PHIGENICS IS NEITHER RESPONSIBLE NOR LIABLE FOR ANY DAMAGES ARISING OUT OF YOUR USE OF THE PVT. This report shall not be reproduced except in full and with the written approval of the laboratory.

PASH Number	Date Inoculated	Date Analyzed	Collector	Location Identification	Category (Potable/Utility)	Molecular Marker Negative Screen	TimeZero™			Standard ISO			
							Total Bacteria	Lpn S1	Lpn S2-14	Legionella Spa	Lpn S1	Lpn S2-14	Legionella Spa
							CFU/mL						
349657	2019/10/04	2019/10/15	D. Ostrand	AR Dept. Of Health Cooling Valve Tower 2nd Spicket On Left	Potable	Not Detected	10 ⁵	ND	ND	ND	<1	<1	<1



Disclaimer: Results from the PVT, or from any other analytical protocol for that matter, do not necessarily provide enough evidence to ensure that hazards from pathogenic microorganisms have been eliminated or controlled nor that risk of harm from such hazards has been reduced. Results from the PVT should only be interpreted within the context of properly designed and implemented water management programs. No guarantee regarding results is expressed or implied. **THE PVT AND THE RESULTS IT PRODUCES ARE PROVIDED ON AN "AS IS" BASIS. YOU ASSUME TOTAL RESPONSIBILITY AND RISK FOR YOUR USE OF THE PVT AND PHIGENICS IS NEITHER RESPONSIBLE NOR LIABLE FOR ANY DAMAGES ARISING OUT OF YOUR USE OF THE PVT. This report shall not be reproduced except in full and with the written approval of the laboratory.**

From: Houston, Marsha (CDC/DDID/NCIRD/DBD)
Sent: Fri, 12 Jul 2019 17:44:44 +0000
To: Smith, Jessica (CDC/DDID/NCIRD/DBD); Cooley, Laura A. (CDC/DDID/NCIRD/DBD)
Cc: Edens, William (Chris) (CDC/DDID/NCIRD/DBD); Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR); Craig, Allen (CDC/DDID/NCIRD/DBD)
Subject: RE: Legionella related activities

Thanks Jessica. This more than enough info. –Marsha

From: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Sent: Friday, July 12, 2019 1:40 PM
To: Houston, Marsha (CDC/DDID/NCIRD/DBD) <akq2@cdc.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>
Cc: Edens, William (Chris) (CDC/DDID/NCIRD/DBD) <iek4@cdc.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <n timer@cdc.gov>
Subject: RE: Legionella related activities

Hi Marsha,

Sorry this is coming a little after the deadline provided. We haven't had any Epi-Aids or site visits to the states listed below; all assistance provided was remote.

Arkansas:

- Currently providing assistance to the National Park Service (NPS) and AR state health department regarding a cluster of 3 Legionnaires' disease (LD) cases associated with the Quapaw spa in Hot Springs in 2018 and 2019. Since January 2019 we've provided guidance with environmental investigation, sampling, and guest notifications related to that cluster. The most recent case occurred in June 2019 and our environmental health team members are providing remote assistance with development of a sampling plan to be carried out by NPS and the state next week.

Missouri:

- (b)(3)
-

Ohio:

- (b)(3)

(b)(5)

We have not been contacted by Indiana for technical assistance in the last 12 months.

Please let me know if there are any questions or if you need any additional info.

Thanks,
Jessica

—
Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NCIRD/DBD/Respiratory Diseases Branch
404.718.5205 | lyd7@cdc.gov

From: Houston, Marsha (CDC/DDID/NCIRD/DBD) <akq2@cdc.gov>
Sent: Tuesday, July 9, 2019 1:59 PM
To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>
Cc: Edens, William (Chris) (CDC/DDID/NCIRD/DBD) <iek4@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Subject: Legionella related activities
Importance: High

Hello *Legionella* team.

Can you please tell me if you have engaged in providing technical assistance, EPI-Aid, etc. in any of the following states during the last 12 (twelve) months/ If so, can you provide a 2-3 statement overview of your activity? This information (if appropriate) will be included in state specific briefing documents for the CDC Director.

Arkansas, Missouri, Ohio and Indiana

Information is needed by noon on Friday July 12, 2019.

Thanks—Marsha

From: Said, Maria
Sent: Fri, 9 Aug 2019 10:28:46 -0400
To: Lucas, Claressa (CDC/DDID/NCIRD/DBD);Smith, Jessica (CDC/DDID/NCIRD/DBD);Cooley, Laura A. (CDC/DDID/NCIRD/DBD)
Cc: Everitt, Brent;Kurt Kesteloot;Miller, Laura
Subject: Re: DRAFT Press Release - Final Results at Hot Springs - Quapaw

Hi Claressa,

Can you help us explain this in plain language? I'll write down below my understanding, based on conversation and what I see in the CDC laboratory guidance (<https://www.cdc.gov/legionella/labs/proccdurcs-manual.html>), but please let me know if I don't have it correct.

What I understand is that in our case, because the suspicious colonies grew on agar without cysteine but not on agar with cysteine, they are presumed to NOT be legionella. True Legionella should grow on agar with cysteine and not grow on agar without cysteine. Only those colonies that follow this pattern should go on to additional testing, using direct fluorescent antibody (DFA) or slide agglutination test (SAT), which can provide information on species type.

However, in an effort to get results to us as quickly as possible, the lab performed the DFA or SAT tests on the suspicious colonies that grew on agar without cysteine, which is not the correct order. They should have looked first at growth in the agar with cysteine and then plated these on agar without cysteine (or blood agar) to ensure that no growth occurred on the agar without cysteine (or blood agar), confirming that the colonies from the agar with cysteine were indeed Legionella.

The report describes the blood agar result as "Negative", but in the cover letter, it states that there was growth on blood agar. My understanding of this is that "Negative" means negative for legionella -- precisely because there was growth - and that growth must be due to a different type of bacteria.

Is this correct?

Thank you!
Maria

did not grow on the agar with cysteine, this su

On Fri, Aug 9, 2019 at 9:43 AM Miller, Laura <laura_a_miller@nps.gov> wrote:
Here is the final report from the lab. If you all can help us with some plain language to interpret this, that would be great.

On Fri, Aug 9, 2019 at 8:39 AM Said, Maria <maria_said@nps.gov> wrote:

Hi Laura,

Was there a written email from the lab? If so, we could see how they worded it.

If not, I think I would say that preliminary cultures were reported to us as consistent with Legionella, and based on this understanding, we closed the Quapaw out of concern for public health. However, follow-up confirmatory testing was all negative.

I don't think I would talk in terms of cycles. And I think talking about different media might get you into the weeds and could get confusing. But this is a tough one -- I may be wrong.

The four samples were only a small minority of the total samples drawn -- I don't have the exact number, but there were many (Kurt do you know?) and included both bulk water samples and swab samples. The four that were reported as preliminarily positive were all swabs.

Maria

On Fri, Aug 9, 2019 at 9:26 AM Miller, Laura <laura_a_miller@nps.gov> wrote:

All,

I expect Brent and I both will start receiving calls today about the Quapaw. I want to understand the science of it all better. Is it fair to say that the preliminary results had suspicious cultures in four samples (which were about half of the total samples) and because public health and safety was at issue, we closed the Quapaw until we had final results. Once the cultures completed their cycle (?) they all were negative for Legionella bacteria. I know they used a different medium to grow the final batch of cultures on. How could we best explain that if it comes up?

Thank you,
Laura

On Thu, Aug 8, 2019 at 4:31 PM Everitt, Brent <brent_everitt@nps.gov> wrote:

Good Afternoon,

Please see the attached draft. Let me know your thoughts and comments. Please also share with additional people who should look at the release prior to issuing.

Best Regards,

--

Brent Everitt, MBA
Acting Special Assistant to the Regional Director
Midwest Regional Office

402-661-1720

Regular Assignment:
Chief of Communications
Gulf Islands National Seashore

"I can't offer you rank or fame or salary - only the chance to do some great public service" - Secretary of the Interior Franklin Lane to Stephen Mather

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Laura A. Miller
Superintendent
Hot Springs National Park
101 Reserve Street
Hot Springs, AR 71901
501.623.2824
870.302.9250 (cell)
501.624.1037 (fax)
www.nps.gov/hosp

✕

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
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Laura A. Miller
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x

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
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Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Said, Maria
Sent: Thu, 11 Jul 2019 15:04:31 -0400
To: Haselow, Dirk (CDC arkansas.gov);Cooley, Laura A. (CDC/DDID/NCIRD/DBD);Smith, Jessica (CDC/DDID/NCIRD/DBD);Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
Cc: Kesteloot, Kurt;Sara Newman
Subject: Supplemental Questionnaire
Attachments: Legionella_HOSP_Quapaw_Supplemental questionnaire.V3.docx

Hi Dirk, Jessica, Laura, and Sooji,

Attached is the supplemental questionnaire we used for the last patients.
Jessica, as you suggested, it does have a question about showers.
Thank you very much for your help with this.
Best,
Maria

Legionellosis Supplemental Questionnaire — Hot Springs National Park, AR

Patient Name: _____

Sex: M/F

County, State: _____

Zip Code: _____

Date of Birth: ___/___/_____

Onset Date: ___/___/_____

In the 10 days prior to the onset of your illness:

1. Did you visit the Quapaw Baths & Spa at 413 Central Avenue, Hot Springs National Park, AR 71901?

Yes

No

2. If you were at the spa, did you (please check all that apply):

Take a shower in the spa

Sit in a thermal pool in the spa

Use a private bath in the spa

Sit in the steam cave in the spa

Spend time next to or walk past a fountain in the basement massage area

3. While you were in Hot Springs, AR, did you walk next to or spend time around any decorative fountains?

Yes

No

If so, where? _____

4. While you were in Hot Springs, AR, and Hot Springs National Park did you take part in any other activity that may have exposed you to aerosolized water?

Yes

No

5. If you did take part in another activity that may have exposed you to aerosolized water, please describe the activities:

6. Do you have any additional concerns regarding Legionella exposure that you would like to share?

From: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
Sent: Fri, 4 Jan 2019 10:41:52 -0500
To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD)
Subject: RE: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis (b)(6)

Hope you are having a great time in NYC! Things are going well here (relatively quiet).
See you soon!!
Sooji

From: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>
Sent: Friday, January 4, 2019 10:40 AM
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Subject: RE: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis (b)(6)

Thank you, Sooji! Hope things are going well. Looking forward to seeing you guys Monday!

From: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Sent: Friday, January 4, 2019 9:38 AM
To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>
Subject: RE: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis (b)(6)

Thanks Laura!! We will schedule a call with Maria!
Sooji

From: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>
Sent: Thursday, January 3, 2019 5:54 PM
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Subject: Fwd: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis (b)(6)

Hey Sooji! Happy new year! Looks like Maria wants to schedule a call Friday. I hope things haven't been too busy this week!!! ☺ Could you or Jess or Chris maybe help Maria out?

Many thanks, as always!

From: Said, Maria <maria_said@nps.gov>
Date: January 3, 2019 at 5:42:29 PM EST
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Cc: CATHERINE.WATERS@ARKANSAS.GOV <CATHERINE.WATERS@arkansas.gov>, Debbie.Pledger@arkansas.gov <Debbie.Pledger@arkansas.gov>, NCID DBMD Travel-Legionella (CDC) <travellegionella@cdc.gov>, David Kostamo <david_kostamo@nps.gov>, Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>, Lauren Miller <lauren_miller@partner.nps.gov>
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC45011

Hi all,

I phoned the spa, and the voice message states that they are closed for annual maintenance January 1 through January 10.

I also posted an Epi-X, to see if there have been any additional cases.

I'm working on contacting the Superintendent of the park to make her aware.

This investigation/response will be complicated by the government shutdown.

Laura, would it be possible to talk tomorrow about appropriate next steps? An environmental assessment was done back in July. I'd be interested to hear your thoughts on environmental testing.

Thank you!

Maria

On Thu, Jan 3, 2019 at 5:00 PM Said, Maria <maria_said@nps.gov> wrote:

Hi Sooji,

Thanks for letting us know about this. From Google maps, it looks like the address the first case (b)(6) gave is a building outside the park. However, if they named the Quapaw Baths & Spa specifically, I assume that is where they visited. It is concerning that this is the second case linked to the spa in the last 6 months.

The National Park Service is closed with the government shutdown, although some parks are continuing to operate. I will look into the situation at Hot Springs National Park to see if they are running, and if so, at what capacity.

Cat, have you had any clusters linked with any hotels in non-park land? It looks like these two patients stayed at different hotels.

Thanks.

Maria

On Thu, Jan 3, 2019 at 4:01 PM Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov> wrote:

Dear Colleague(s):

Please see the attached notification regarding a case of Legionnaires' disease that may be travel-associated.

This case, (b)(6), used the hot tub at Quapaw Baths & Spa in Hot Springs National Park, with the address "413 Central Ave." There was another case in the past year, (b)(6) (attached), who used the hot tub at Quapaw Hot Springs National Park as well. However, for (b)(6) the address is written as (b)(6). I was wondering if updated information may be available for (b)(6) related to the patient's hot tub use?

Thanks.

—
Sooji Lee, MS, MSPH
Epidemiologist (PHRC, Inc.)
Legionella Team (NCIRD/DBD/RD3)
Centers for Disease Control and Prevention
1600 Clifton Road, NE H24-6 Atlanta, GA 30329
Phone: 404-718-3192 | Email: slee7@cdc.gov

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Said, Maria
Sent: Thu, 8 Aug 2019 18:18:43 -0400
To: Smith, Jessica (CDC/DDID/NCIRD/DBD); Lucas, Claessa (CDC/DDID/NCIRD/DBD)
Cc: Brent Everitt; Alexandra Picavet; Laura Miller; Kesteloot, Kurt
Subject: Press release - language around testing and labs
Attachments: 080819_HotSpringsPublicHealth_Release_v1.MS.docx

Hi Jessica and Claessa,

Here is a draft press release. Does this look okay to you, especially with regard to the language around laboratory testing?

Thank you!
Maria



National Park Service
U.S. Department of the Interior

Hot Springs
National Park

101 Reserve Street
Hot Springs, AR 71901

Phone: (501) 620-6715
www.nps.gov/HotSprings

Hot Springs News Release

Release Date: August 8, 2019

Contacts: Brent Everitt, Brent_Everitt@nps.gov, 850-393-7952

Finalized Testing Returns Negative Final Legionella Results at Park

Water-related services at Quapaw Bath and Spa will resume

Hot Springs, Ark. – Hot Springs National Park has received finalized negative results of Legionella bacteria testing at the Quapaw Baths and Spa which have returned negative results.

results an an-

close water services at the spa while the park and public

health official awaited final confirmatory results from the testing.

ublic health officials and the park have cleared the Quapaw to resume all services.

Based on the preliminary results last week, the Quapaw immediately began remediation and disinfection efforts while waiting for finalized test results.

Commented [SMA1]: It wasn't really an abundance of caution it was appropriate action given what was thought to be a public health threat.

Commented [SMA2]: Would take this out, as we don't really have a plan yet.

All tests including swab samples inside and outside of the spa, as well as, bulk water testing have returned negative results. Throughout this process, the Quapaw Baths & Spa has fully cooperated with the National Park Service Public Health Officials.

Commented [SMA3]: I think this repeats what was stated before – and people may not understand what swab tests or bulk tests are.

All laboratory testing was performed at an ELITE member lab, which is part of the CDC's Environmental Legionella Isolation Techniques Evaluation Program.

The park continues to work closely with the National Park Service Office of Public Health (OPH), the Arkansas Health Department, and the Centers for Disease Control and Prevention (CDC) to protect the health of those who visit the park.

About Hot Springs National Park: Established as a federal reservation in 1832 to protect the unique geothermal spring water and associated lands for public health, wellness, and enjoyment. In 1921, the area became a national park with the same mission; preservation of the 47 hot springs that come out of the Hot Springs Mountain and the historic resources built for visitor enjoyment of the hot springs.

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Visit us at www.nps.gov/HotSprings, on Facebook www.Facebook.com/HotSpringsNPS, and Instagram www.Instagram.com/HotSpringsNPS.

About the National Park Service: More than 20,000 National Park Service employees care for America's 419 national parks and work with communities across the nation to help preserve local history and create close-to-home recreational opportunities. Visit us at www.nps.gov, on Facebook www.facebook.com/nationalparkservice and Twitter www.twitter.com/natlparkservice.

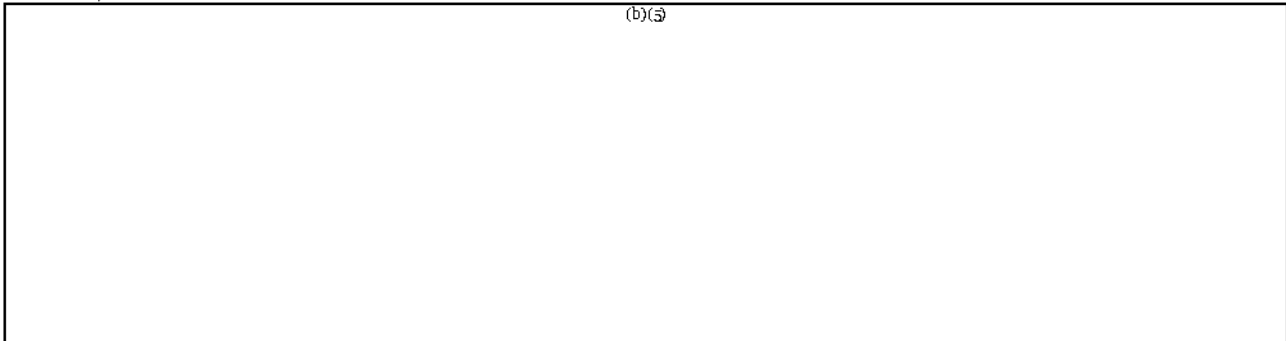
--NPS--

EXPERIENCE YOUR AMERICA™

The National Park Service cares for special places saved by the American people so that all may experience our heritage.

From: Lucas, Claressa (CDC/DDID/NCIRD/DBD)
Sent: Mon, 12 Aug 2019 14:38:43 +0000
To: Kesteloot, Kurt; Said, Maria
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD); Cooley, Laura A. (CDC/DDID/NCIRD/DBD)
Subject: RE: [EXTERNAL] RE: DRAFT Press Release - Final Results at Hot Springs - Quapaw

Hi Kurt,



Hope that makes sense. Happy to chat, if you like.

Best wishes,
Claressa

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Friday, August 9, 2019 9:08 PM
To: Said, Maria <maria_said@nps.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>
Subject: Re: [EXTERNAL] RE: DRAFT Press Release - Final Results at Hot Springs - Quapaw

Hi Maria and Claressa,

Thanks so much.

I'm confused, didn't the lab run with cysteine simultaneously or first and everything was negative? We had all of the with cysteine results last week and were told negative. That is the only way they processed the samples back in January of 2019 (with cysteine) and everything was negative then too.

Sorry, just want to make sure I understand correctly.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS

Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

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On Fri, Aug 9, 2019 at 3:42 PM Said, Maria <maria_said@nps.gov> wrote:

Thanks Claressa - much appreciated.
Maria

On Fri, Aug 9, 2019 at 1:57 PM Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov> wrote:

Hi Maria,
Yes, I think you understand the gist of the problem. I made a couple of suggestions below in strikethrough and red that I hope clarify a bit. Please let me know if there's anything else I can do for you.

Best wishes,
Claressa

From: Said, Maria <maria_said@nps.gov>
Sent: Friday, August 9, 2019 10:29 AM
To: Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>
Cc: Everitt, Brent <brent_everitt@nps.gov>; Kurt Kesteloot <kurt_kesteloot@nps.gov>; Miller, Laura <laura_a_miller@nps.gov>
Subject: Re: DRAFT Press Release - Final Results at Hot Springs - Quapaw

Hi Claressa,

Can you help us explain this in plain language? I'll write down below my understanding, based on conversation and what I see in the CDC laboratory guidance

(<https://www.cdc.gov/legionella/labs/procedures-manual.html>), but please let me know if I don't have it correct.

What I understand is that in our case, because the suspicious colonies grew on agar without cysteine ~~but not on agar with cysteine~~, they are presumed to NOT be legionella.

~~True~~ Most members of the genus Legionella should grow on agar with cysteine and not grow on agar without cysteine. Only those colonies that follow this pattern should go on to additional testing, using direct fluorescent antibody (DFA) or slide agglutination test (SAT), which can provide information on ~~species-type~~ serogroup.

However, in an effort to get results to us as quickly as possible, the lab performed the DFA or SAT tests on the suspicious colonies that grew on agar ~~without~~ cysteine before checking to see if the isolates would also grow in the absence of cysteine, which is not the correct order. They should have looked first at growth in the agar with cysteine and then plated these on agar without cysteine (or blood agar) to ensure that no growth occurred on the agar without cysteine (or blood agar), confirming that the colonies from the agar with cysteine were indeed Legionella.

The report describes the blood agar result as "Negative", but in the cover letter, it states that there was growth on blood agar. My understanding of this is that "Negative" means negative for legionella -- precisely because there was growth - and that growth must be due to a different type of bacteria.

Is this correct?

Thank you!
Maria

did not grow on the agar with cysteine, this su

On Fri, Aug 9, 2019 at 9:43 AM Miller, Laura <laura_a_miller@nps.gov> wrote:

Here is the final report from the lab. If you all can help us with some plain language to interpret this, that would be great.

On Fri, Aug 9, 2019 at 8:39 AM Said, Maria <maria_said@nps.gov> wrote:

Hi Laura,

Was there a written email from the lab? If so, we could see how they worded it.

If not, I think I would say that preliminary cultures were reported to us as consistent with Legionella, and based on this understanding, we closed the Quapaw out of concern for public health. However, follow-up confirmatory testing was all negative.

I don't think I would talk in terms of cycles. And I think talking about different media might get you into the weeds and could get confusing. But this is a tough one -- I may be wrong.

The four samples were only a small minority of the total samples drawn -- I don't have the exact number, but there were many (Kurt do you know?) and included both bulk water samples and swab samples. The four that were reported as preliminarily positive were all swabs.

Maria

On Fri, Aug 9, 2019 at 9:26 AM Miller, Laura <laura_a_millcr@nps.gov> wrote:

All,

I expect Brent and I both will start receiving calls today about the Quapaw. I want to understand the science of it all better. Is it fair to say that the preliminary results had suspicious cultures in four samples (which were about half of the total samples) and because public health and safety was at issue, we closed the Quapaw until we had final results. Once the cultures completed their cycle (?) they all were negative for Legionella bacteria. I know they used a different medium to grow the final batch of cultures on. How could we best explain that if it comes up?

Thank you,
Laura

On Thu, Aug 8, 2019 at 4:31 PM Everitt, Brent <brent_cveritt@nps.gov> wrote:

Good Afternoon,

Please see the attached draft. Let me know your thoughts and comments. Please also share with additional people who should look at the release prior to issuing.

Best Regards,

--

Brent Everitt, MBA
Acting Special Assistant to the Regional Director
Midwest Regional Office
402-661-1720

Regular Assignment:

Chief of Communications
Gulf Islands National Seashore

"I can't offer you rank or fame or salary - only the chance to do some great public service" - Secretary of the Interior Franklin Lane to Stephen Mather

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Laura A. Miller
Superintendent
Hot Springs National Park
101 Reserve Street
Hot Springs, AR 71901
501.623.2824
870.302.9250 (cell)
501.624.1037 (fax)
www.nps.gov/hosp

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

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Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
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Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 16 Jul 2019 01:49:15 +0000
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Cooley, Laura A. (CDC/DDID/NCIRD/DBD);Smith, Jessica (CDC/DDID/NCIRD/DBD)
Cc: Hubbard, Brian C. (CDC/DDNID/NCEH/DEHSP)
Subject: Fwd: HOSP-Legionella-Quapaw Update July 15, 2019

Hey LD Team! I didn't see any of you copied on Kurt's email below.

Troy

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From: Patricia Trap <patricia_trap@nps.gov>
Sent: Monday, July 15, 2019 9:01 PM
To: Kesteloot, Kurt
Cc: Said, Maria; Lauren Miller; Mark Scott; jhenry@atokainc.com; croberts@atokainc.com; Justin Cully; Terry.Paul@arkansas.gov; Richard.McMullen@arkansas.gov; Sara Newman; Gwendolyn Ruppert; Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Alexandra Picavet; Robert Kammel; Clara Wooden
Subject: Re: HOSP-Legionella-Quapaw Update July 15, 2019

Thanks Kurt for this report and diligence in testing. Let me know if you need anything.

Patty

Regional Director (Acting)
Midwest Region, National Park Service
office: 402-661-1520
cell: 402-637-2414

On Jul 15, 2019, at 7:37 PM, Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:

Good Evening Everyone,

Thanks for the assistance today! We took several bulk and swab samples in the Quapaw today. We hope to meet tomorrow around 0900 at the Hot Springs Nation Park Headquarters building.

Here is a brief of some of the testing conducted and proposed.

Testing conducted:

Quapaw:

Main Level:

Single Bath Use Area (Room F and G) likely Person 1 and Person 2 rooms for latest scenario.

Room F: Bulk mixed sample of tempered and thermal water (~104.8F) and swab in the jets.

Room G: Bulk thermal sample (~137F), bulk tempered sample (~94F), swab jets and micro bubbles emitter, and remove jet and swab.

Left Pool: Bulk and Swab

Center Pool: Bulk and Swab

Right Pool: Bulk and Swab

Upper Pool:

Shower Heads: Bulk and Swab

Basement:

Shower next to the only individual basement tub that has a skylight (~107F) bulk sample and swab.

Hatch area outside of the cave: excesses waste thermal water in large reservoir (~133F). A bulk sample was taken and two swabs were taken.

Basement Water cascade wall fountain. Occasionally disinfected and was disinfected last week. It uses city water and had a temp of ~74F.

Basement Cave: I was not present but think it was just swabbed.

Please note: the temperatures and samples collected are from memory and the lab recorded the actual numbers. There were approximately 12 swabs may have been gathered along with about 9 bulk samples.

Proposed Testing:

Fountains: Approximately 5 or 6 bulk and swabs

Cooling Tower: Bulk of mixed water (from both towers) and swab of both towers

Tempered (cold) thermal: Cold water at the tank and likely in the Quapaw (Bulk and Swab)

Thermal Water: HQ tank and upper tank (Bulk and Swab)

Quapaw: Swab duct-work in the main bathing area and possibly individual baths area.

Estimated samples remaining are: 11 bulk and 14 swabs.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS

Supervisory Public Health Consultant, Midwest Region

National Park Service, Office of Public Health (OPH),

601 Riverfront Drive

Omaha, NE 68102

Office Phone: 1-402-661-1718

Office Fax: 1-402-661-1719

Cell Phone: 1-202-641-0055

Email: Kurt_Kestcloot@nps.gov

x]

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

On Fri, Jul 12, 2019 at 3:22 PM Said, Maria <maria_said@nps.gov> wrote:

Situation

- We know of 3 cases of confirmed or suspect Legionnaires' disease associated with Quapaw Bath and Spa, with dates of onset in July 2018, November 2019, and June 2019. The most recent case was unfortunately a death.
- A collaborative team including HOSP, the NPS OPH, and Arkansas Department of Health, all in consultation with the CDC, is working on the public health response to this cluster/outbreak.
- Environmental sampling is planned for early next week.

Updates for July 12, 2019

- Kurt put together a draft sampling plan, a presentation showing photos of the park, and a detailed map of the park for discussion with Troy of CDC and Terry of Arkansas.
- We had call with Quapaw and communicated that (1) we had a third case that was a fatality; (2) we plan additional environmental testing; (2) guest notifications are needed going back one month; (3) clearly visible notifications of all current spa visitors are needed until environmental testing results are back (otherwise the

spa would have to close until we have results); (4) we need documentation of the numbers of guests identified with visits over the last month and how many have been reached with notifications; (5) the spa should not change operations in any way or alert employees, so that when we do testing, we get as representative a sample as possible; (6) Dirk Haselow (state epi for Arkansas) and I will need to see and approve the guest notifications and signage for current visitors.

- The Quapaw expressed understanding and agreement with the plan. Later they phoned and asked if people who only came in for massage should be notified as well, and I confirmed with them that all guests, including for massage, should be notified.
- Dirk Haselow (state epi for Arkansas) and I have reviewed drafts of the Guest Notification Letter to previous guests as well as the notifications that will go to current visitors. We have also provided a link to the CDC fact sheet for distribution. The owners expressed that they will can start informing current guests through their sign-in process as early as today.

Please let me know of any edits or additions to this summary.

Maria

From: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Sent: 15 Jul 2019 14:57:55 +0000
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Hunter, Candis (CDC/DDNID/NCEH/DEHSP)
Cc: Cooley, Laura A. (CDC/DDID/NCIRD/DBD); Lucas, Claressa (CDC/DDID/NCIRD/DBD); Hubbard, Brian C. (CDC/DDNID/NCEH/DEHSP)
Subject: Fwd: Epi-Aid/"Epi-Experience"

Troy,

Getting ready to get on the plane for the next 5 hours. Please closely coordinate with Laura on potential ch staffing.

Please also link Brian and Adrienne in (Brian copied here as an early head up) as this starts to materialize. Travel will have to go through division/center this late in the year.

The pelican case is turn key and ready to go. Two colorimeters, reagent, ph and temp meters.

Please work with Brian when it comes to ch staffing. I will check in later today.

PS: I would not worry about VIIA call if this conflicts with afternoon call.

Thanks,

Jasen

Sent from iPhone

From: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>
Sent: Monday, July 15, 2019 10:03 AM
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Lucas, Claressa (CDC/DDID/NCIRD/DBD)

Cc: Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Smith, Jessica (CDC/DDID/NCIRD/DBD)

Subject: Fw: Epi-Aid/"Epi-Experience"

Hi Jasen and Claressa! Jasen, hope your travels are going smoothly. Just wanted to keep you posted re: the latest in Arkansas. Claressa, wanted to loop you in. There is a cluster of cases associated with some hot springs in Arkansas. We are working with the National Park Service and folks at the HD to help them respond. Maria (from the NPS) provides a synopsis of the current status below. (b)(3)

(b)(3)

See below. Will keep y'all posted.

Let us know if you have any questions.

Thanks!

Laura

From: Cooley, Laura A. (CDC/DDID/NCIRD/DBD)

Sent: Monday, July 15, 2019 9:56 AM

To: Said, Maria

Cc: Sara Newman; Smith, Jessica (CDC/DDID/NCIRD/DBD); Ritter, Troy (CDC/DDNID/NCEH/DEHSP)

Subject: Rc: Epi-Aid/"Epi-Experience"

Hi, Maria. Glad to hear things have been going smoothly so far!

I don't know much about the "Epi-Experience"—from what I've heard through the grapevine, it sounds more like an opportunity for HQ EISOs to get experience in state HDs (i.e., more like a month-long TDY as opposed to something specifically response-related). That being said, we do have 2 in-person mechanisms for helping HDs respond to outbreaks: Epi-Aids and onsite technical assistance, the latter being an option for getting onsite technical assistance from the *Legionella* team without involvement of an EISO. Happy to talk through typical reasons for choosing one vs the other.

We are always happy to help when a state HD asks for onsite assistance. The underlying objective is generally to help the state HD ensure that risk for transmission has been minimized, but our specific role can vary from situation to situation—usually some combination of:

- Epi: helping with case finding, questionnaire development, conducting interviews
- EH: guiding the environmental assessment, developing a sampling plan, guiding the actual sampling
- Lab: processing environmental samples
- General: building capacity to investigate clusters, helping develop recommendations based on epi, EH, and lab findings

Since many of these activities are in motion, we would just need to talk about the specific request for us to be there in person vs continuing to provide assistance remotely.

Sounds like there is a call scheduled for this afternoon to discuss the sampling plan? Perhaps we should set up a separate call to talk through this? It would be important to have folks from Arkansas on that call since they would be the ones requesting onsite assistance.

Just let me know what works for you guys!

Laura

Laura A. Cooley, MD, MPHTM
CDR, U.S. Public Health Service
Respiratory Diseases Branch
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention
1600 Clifton Road, Mailstop H24-6
Atlanta, GA 30329

phone 404.639.2096

From: Said, Maria <maria_said@nps.gov>
Sent: Monday, July 15, 2019 9:27:40 AM
To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD)
Cc: Sara Newman
Subject: Epi-Aid/"Epi-Experience"

Hi Laura,

The Health Officer from Arkansas is interested in more involvement by CDC through an Epi-Aid, or perhaps through an "Epi-Experience." (I have not heard of this mechanism, but apparently this is a less formal way for CDC to be involved -- do you know about it?).

I have been really grateful for all your involvement (you, Jessica, and Troy) and think that we have a good collaboration that has involved CDC, the state, the park, and the NPS Office of Public Health. We had a very good call with the owners of the spa on Friday, and they agreed to all our requests for guest notification for previous visitors within the last month, notification of current visitors to the spa, and environmental testing. Kurt Kesteloot, an engineer with us in the NPS Office of Public Health, is arriving at Hot Springs today to help with environmental testing -- and has been in close contact with Terry from Arkansas and Troy from CDC as he develops the sampling plan. The independent laboratory in Arkansas is aware of the testing and prepared to accept samples.

I am interested to hear your thoughts on an Epi-Aid/Epi Experience. We have not raised the topic with the park -- and ultimately, as they have jurisdiction, they would need to approve this plan -- but I wanted to raise the possibility with you.

I feel confident that we have a good plan in place -- but I also want to make sure that we are doing all we can to protect visitors to and employees in the park.

Thanks.

Maria

--

Maria Said, MD, MHS | CDR, U.S. Public Health Service

Epidemiology Branch Chief | Office of Public Health | National Park Service

Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 Washington, DC 20240

Office Tel: 202-513-7151 | Email: maria_said@nps.gov

Website (public): <https://www.nps.gov/orgs/1878/index.htm>

Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Kesteloot, Kurt
Sent: 25 Nov 2019 08:11:36 -0600
To: Lucas, Claressa (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Miller, Laura;Smith, Jessica (CDC/DDID/NCIRD/DBD);Said, Maria;Mark Scott;Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Tracy Simmons;Tricia Horn;Alexandra Picavet;Robert Bryson;Peter Budde
Cc: Sara Newman;Herbert Frost;Patricia Trap
Subject: Call to Discuss The Latest Legionella Test Results from Arkansas?

Good Morning Everyone,

Is there a good time to have a call today or tomorrow regarding the latest test results from Hot Springs, AR? Ultimately, there was one positive sample. That sample came from a long waterline that was flushed but has had little to no use over the last several years. So, I believe the flushing has shown to be one effective step in lowering the risk of Legionella in the water. It would be great to talk to other experts from CDC to hear your perspective.

It would also be great to talk about a press release on the latest round of test results.

There are several other questions to ask and discuss.

On the call I would like to discuss the following:

1. The latest test results and procedure for sampling prior to sampling
2. A list of questions I have
3. Press release information
4. Any additional questions or public health concerns
5. Long-Term plans for drinking water and recreational water
6. Planning for a call with the State Health Department

I look forward to connecting with everyone soon and appreciate any collaboration on this important National Park resource and public health matter.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3, 4, and 5, Great Lakes,
Mississippi Basin, and Missouri Basin
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718

Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Sent: 4 Oct 2019 14:32:31 +0000
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: FW: 10-4-19 Legionella Sampling Plan
Attachments: HOSP Thermal Water Sampling Plan 10-4-19.pdf

FYI... Jasen, I don't know if Troy already shared this with you, just passing along in case you have time to look and thoughts to share.

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Friday, October 4, 2019 7:48 AM
To: Mark Scott <Mark_Scott@nps.gov>; laura_a_miller@nps.gov
Cc: Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Maria Said <maria_said@nps.gov>; Robert Kammel <bob_kammel@nps.gov>
Subject: 10-4-19 Legionella Sampling Plan

Good Morning Everyone,

Mark and I talked yesterday about the attached sampling plan for today. I have attached a drawing that lists the samples and shows a rough overview of the system. If anyone has any additional thoughts, comments, or questions, please let me know.

Currently, I have 23 locations listed. Thus, we have two more available if needed. I have not listed the thermal water system main tank under administration because it has been tested at least three times (once with PCR/new lab) and has been negative all times. I have also excluded the showers in the Quapaw because they were plumbed improperly and will not be used that way ever again. All of the tests focus on the NPS water system, we could talk to the city about testing their fountains and/or test the city water in the Quapaw (showers on main level and one in the basement). Any thoughts?

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service,Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x|

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On Thu, Oct 3, 2019 at 3:50 PM Maria Said <maria_said@nps.gov> wrote:

Thanks Claessa. And to take it one step further, positive PCR results will be much less useful, right? My understanding is that they are not accurate for predicting culture results and we would just have to wait for cultures to be finalized, correct?

Thank you again!

Maria Said, MD, MHS
CDR, US Public Health Service
Epidemiology Branch Chief
Office of Public Health
National Park Service
(O) 202-513-7151
(C) 202-538-5682

> On Oct 3, 2019, at 3:52 PM, Lucas, Claessa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov> wrote:

>

> Hi Maria,

> Yes, negative PCR results are >99% predictive of a negative culture result.

>

> Best wishes,

> Claessa

>

> -----Original Message-----

> From: Maria Said <maria_said@nps.gov>

> Sent: Thursday, October 3, 2019 3:49 PM

> To: James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>;

> jennifer.dillaha@arkansas.gov; Kurt Kesteloot <kurt_kesteloot@nps.gov>; laura_a_miller@nps.gov;

> Lucas, Claessa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD)

> <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>

> Subject: Re: PCR?

>

> It looks from the lab that PCR results would be available the next day after testing.

>

> Claessa, am I correct that negative PCR results are highly predictive that culture results will be negative as well?

>

> It seems to me that if we are able to get this information quickly, that will be very helpful to us in determining our modes of notification.

>

> Thank you! Maria

>

> Maria Said, MD, MHS

> CDR, US Public Health Service

> Epidemiology Branch Chief

> Office of Public Health

> National Park Service

> (O) 202-513-7151

> (C) 202-538-5682

>

>

>> On Oct 3, 2019, at 3:40 PM, Maria Said <maria_said@nps.gov> wrote:

>>

>> Does anyone know how quickly PCR results could be turned around? My

>> understanding of PCR is that negative PCR has a high predictive value and could be very useful in this situation if we can get results quickly. Thanks. Maria

>>



Hot Springs National Park

Thermal Spring Water Distribution System Flow Chart

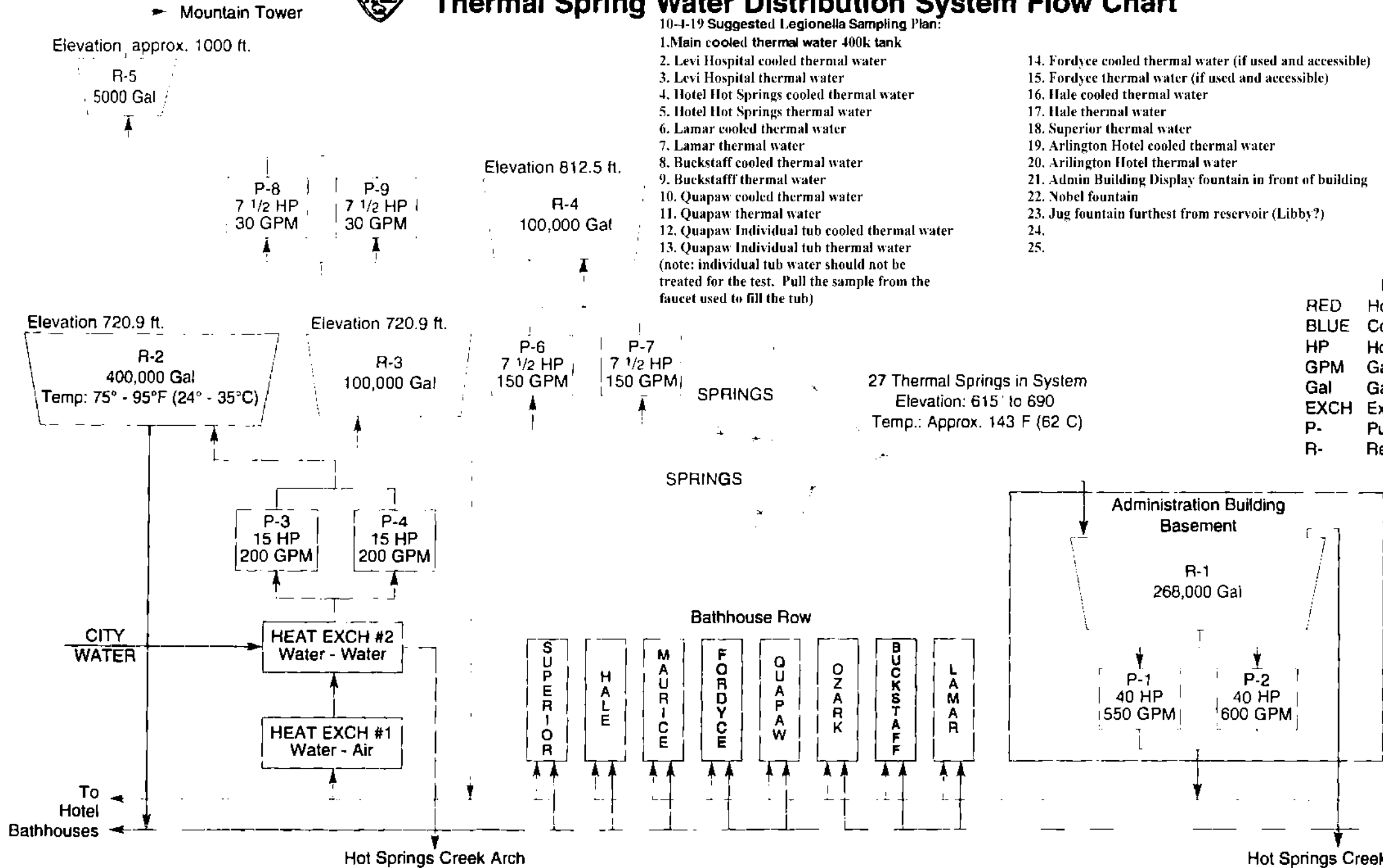
10-4-19 Suggested Legionella Sampling Plan:

1. Main cooled thermal water 400k tank
 2. Levi Hospital cooled thermal water
 3. Levi Hospital thermal water
 4. Hotel Hot Springs cooled thermal water
 5. Hotel Hot Springs thermal water
 6. Lamar cooled thermal water
 7. Lamar thermal water
 8. Buckstaff cooled thermal water
 9. Buckstaff thermal water
 10. Quapaw cooled thermal water
 11. Quapaw thermal water
 12. Quapaw Individual tub cooled thermal water
 13. Quapaw Individual tub thermal water
- (note: individual tub water should not be treated for the test. Pull the sample from the faucet used to fill the tub)

14. Fordyce cooled thermal water (if used and accessible)
15. Fordyce thermal water (if used and accessible)
16. Hale cooled thermal water
17. Hale thermal water
18. Superior thermal water
19. Arlington Hotel cooled thermal water
20. Arlington Hotel thermal water
21. Admin Building Display fountain in front of building
22. Nobel fountain
23. Jug fountain furthest from reservoir (Libby?)
- 24.
- 25.

LEGEND:

- RED Hot thermal water
- BLUE Cooled thermal water
- HP Horse Power
- GPM Gallons Per Minute
- Gal Gallons
- EXCH Exchanger
- P- Pump
- R- Reservoir



THE THERMAL WATER DISTRIBUTION SYSTEM OF HOT SPRINGS NATIONAL PARK

Systems for distributing thermal spring water at Hot Springs National Park have been around a long time, evolving along with the bathhouses. In the first half of the nineteenth century most "bathhouses" were rough wooden shacks or even tents, built over natural tufa cavities (sometimes enlarged) that held spring water. More elaborate bathhouses began springing up in the 1850s. Some boasted individual bath rooms with wooden tubs, requiring a network of wooden troughs to direct thermal water into flumes on the roofs. Inside the bathhouse, bathers pulled a rope, opening a mechanism that released water from the flume into the tub.

When a disastrous 1878 fire destroyed most of the bathhouses along Hot Springs Creek, the government seized the opportunity to improve both bathhouse construction and thermal water distribution. The Avenue Hotel Bathhouse, built in 1880, was allowed to set up a pump on the reservation. The first reservoir was built in 1880 as well. On June 8, 1891, a pumping station and reservoir were completed on the present site of the administration building in order to enhance thermal water distribution. Unfortunately a law passed that same year required water to be transported by gravity flow, and the pumping equipment was never used.

The government built more reservoirs in the 1890s to impound spring water and increase the flow. In 1897 all but four springs were encased in brick archways and their water piped to bathhouses and reservoirs; the remaining springs were enclosed by 1901. On November 10, 1903, Congress authorized funds for building surface and deep reservoirs on Hot Springs Mountain, adding to the collection of older reservoirs already in use. In 1924 National Park Service engineers drew a plan showing the existing complex of springs, reservoirs, and plumbing in preparation for the first central collection, impounding and distribution system for the thermal water, completed around 1931. Meters installed on bathhouse lines were not fully functional until 1933. The present system allows better control and monitoring of the water flow.

The springs are located on about 2.8 acres along Bathhouse Row and the Grand Promenade. The bulk of the approximately 850,000 gallons of thermal water flowing each day from Hot Springs Mountain is collected from 27 of the 47

presently active springs. Each spring in the collection system has been sealed and covered with a green box about four feet square with a metal cover, chain, and padlock. The green boxes on the lower west slope of Hot Springs Mountain and the heat exchange units at the north end of Bathhouse Row are the most visible components of the thermal water distribution system and represent its source portion. Not all of the boxes indicate a spring; some hold only valves and collection plumbing. The boxes higher up on the mountain allow access to the underground reservoirs and plumbing.

The valve and spring collection boxes are connected with the plumbing system delivering thermal water to reservoir R-1 under the east end and parking lot of the administration building at the south end of Bathhouse Row. This reservoir holds about 268,000 gallons and includes an overflow pipe connected to the Hot Springs Creek arch.

In the administration building basement, two pumps (P-1 and P-2) move the thermal water through a twelve-inch cast-iron pipe in the Hot Springs Creek arch to the bathhouses, the heat exchangers, and a 100,000-gallon underground storage reservoir (R-3) about 120 feet above Bathhouse Row. The elevation of this reservoir ensures an ample supply of water at about 52 pounds per square inch (psi) when pumps P-1 and P-2 are idle. When demand increases, pumps P-6 and P-7 transfer thermal water from reservoir R-3 to another 100,000-gallon reservoir (R4) about 220 feet above Bathhouse Row. The plumbing for a number of bathhouses no longer in operation is still in the distribution system as well.

Surprisingly enough the water within the distribution system stays well above 100°F (37.8°C); the water has been flowing into it for decades, and the terrain around the reservoirs and plumbing is heat saturated. As a result, the water arriving at the bathhouses is far too hot for direct bathing. By the 1890s most of the bathhouses had individual cooling towers to cool down the thermal water. These and similar towers were used until the central thermal water cooling system was completed on February 8, 1950. The system is comprised of two heat exchangers (#1 and #2), two pumps (P-3 and P-4), and a 400,000-gallon reservoir (R-2). The first exchanger is a thermal water-to-air cooling unit that works like a car radiator; it contains a primary and secondary section,

each with a large fan to force air through its radiator cores. When both sections of heat exchanger #1 are unable to cool the water sufficiently, #2 comes on line. This exchanger runs cold city water over the tubes carrying the thermal water but never mixes with it. The city water, which is heated in the process, is discharged into the Hot Springs Creek arch, and pumps P-3 and P-4 move the cooled thermal water (still 100% spring water) into reservoir R-2. This reservoir is next to and at the same elevation as reservoir R-3, so an ample supply of cooled water is also available at about 52 psi. The system for delivering cooled thermal water is similar to the hot spring water distribution system.

By mixing hot and cooled spring water, attendants can administer baths at the temperature (98° to 100°F, 36.7° to 37.8°C) required by regulations. The system was designed to produce thermal water cooled to temperatures ranging from 75° to 90°F (24° to 32.2°C). During most of the year when outdoor temperatures are below 80°F (26.7°C), the system works well, but during the hot summer months the desired temperature range is difficult to achieve. To compensate, heat exchanger #2 has been redesigned, and installation of new equipment began in the first quarter of fiscal year 2001.

The entire system is monitored automatically from the basement of the park administration building. The quantity and temperature of the water coming in from the springs are recorded continuously for 24 hours a day, as are water levels in each reservoir. Meters at each bathhouse transmit readings on the amount of water used to the monitoring center. Analyses of these data alert maintenance workers to the possibility of major leaks or equipment failure.

One source of equipment failure is the buildup of calcium carbonate, or limestone, in the system. Similar to the water found in caves, the spring water contains dissolved limestone that can be deposited in pipes, valves, and other system components, particularly in those handling cooled spring water. Because calcium carbonate is less soluble in cold water, it settles out in greater quantities in cooled water systems. Also called "tufa," the deposit is left wherever the thermal springs flow. In fact, the porous gray tufa formations behind Bathhouse Row are really geological "maps" showing where the springs once flowed freely down the mountainside.

From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 21 Jan 2019 11:35:04 -0500
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Smith, Jessica (CDC/DDID/NCIRD/DBD)
Subject: Fwd: [EXTERNAL] Checking in re: Hot Springs

Hey guys, see note below from Kurt. Do you think

(b)(3)

(b)(3)

Troy

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Date: January 21, 2019 at 2:31:43 PM GMT-2
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>
Subject: Fwd: [EXTERNAL] Checking in re: Hot Springs

Good Morning Troy,

Thanks again for the help with this. The Legionella test results were negative and we have advised that the facility can return to normal operations.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

Attention Federal Employees Only: Please let us know how we are doing by completing a survey found at: <https://www.surveymonkey.com/s/NPS-OPH-CustServ>

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the parks that we share." GREEN DOT

----- Forwarded message -----

From: **Said, Maria** <maria_said@nps.gov>

Date: Mon, Jan 21, 2019 at 10:16 AM

Subject: Re: [EXTERNAL] Checking in re: Hot Springs

To: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>

Cc: Haselow, Dirk (CDC arkansas.gov) <dirk.haselow@arkansas.gov>, Kurt Kesteloot

<kurt_kesteloot@nps.gov>, Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)

<npf3@cdc.gov>

Hi Jessica,

We've received results that are all negative for Legionella. We have told the Quapaw they can resume normal operations.

Thanks very much for your help with this - it is much appreciated.

And we will be in touch if there are any new developments.

Best,

Maria

On Fri, Jan 18, 2019 at 3:00 PM Said, Maria <maria_said@nps.gov> wrote:

Hi Jessica,

During the assessment, a group collected 6 liter samples (one at the cooling tower, one at the cold water pumping/gravity station, and 4 at the bathhouse) and 9 swabs. Results are still pending.

I'm very grateful for your offer to assist and will let you know when we learn more.

Best,

Maria

On Fri, Jan 18, 2019 at 2:54 PM Smith, Jessica (CDC/DDID/NCIRD/DBD)

<lyd7@cdc.gov> wrote:

Hi Maria, Dirk and Kurt,

I wanted to check in this week about how the on-site assessment went in Hot Springs and whether the environmental results have come back or not. I don't mean to add to anyone's plate... we were just curious to hear if there are any updates. And of course we remain standing by if there's anything we can do to be of assistance.

Thanks and hope you all have a good weekend,

Jessica

—

Jessica C. Smith, MPH

Epidemiologist | Centers for Disease Control and Prevention

NCIRD/DBD/Respiratory Diseases Branch

404.718.5205 | lyd7@cdc.gov

--

Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

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Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Google Calendar on behalf of maria_said@nps.gov
Sent: 17 Oct 2019 14:55:22 +0000
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Smith, Jessica (CDC/DDID/NCIRD/DBD);Lucas, Claressa (CDC/DDID/NCIRD/DBD);mark_scott@nps.gov;sara_newman@nps.gov;Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);kurt_kesteloot@nps.gov;laura_a_miller@nps.gov
Subject: Invitation: Hot Springs Legionella - CDC @ Fri Oct 18, 2019 10am - 11am (EDT) (izk0@cdc.gov)
Attachments: invite.ics

You have been invited to the following event.

[more details »](#)

Hot Springs Legionella - CDC

Fri Oct 18, 2019 10am – 11am

Webex to be set up ([map](#))

https://hangouts.google.com/hangouts/_/doi.gov/aria-said

izk0@cdc.gov

- maria_said@nps.gov
- tir4@cdc.gov
- lyd7@cdc.gov
- chl9@cdc.gov
- mark_scott@nps.gov
- sara_newman@nps.gov
- npf3@cdc.gov
- izk0@cdc.gov
- kurt_kesteloot@nps.gov
- laura_a_miller@nps.gov

[Yes](#) - [Maybe](#) - [No](#) [more options »](#)

[Google Calendar](#)

[Learn More](#)

From: Said, Maria
Sent: 22 Jan 2019 22:31:50 -0500
To: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Cc: Haselow, Dirk (CDC arkansas.gov); Kurt Kesteloot; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR); Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Terry Paul
Subject: Re: [EXTERNAL] Checking in re: Hot Springs

Thanks Jessica.

I'll defer to Kurt and am also including Terry Paul from the Arkansas Dept of Health, as they can speak much better than I about the environmental assessment and how to optimize conditions moving forward.

And from me -- another thank you to Arkansas for all your assistance with the assessment and testing. It is very much appreciated.

Best,
Maria

On Tue, Jan 22, 2019 at 5:13 PM Smith, Jessica (CDC/DDID/NCIRD/DBD) <lvd7@cdc.gov> wrote:

Thanks so much for the update, Maria! That is certainly reassuring.

I chatted with Jasen and Troy about this on the EH side, and we were wondering in general

(b)(5)
if so, were there any
recommendations (b)(5)

Depending (b)(5)

(b)(5)

Happy to discuss further anytime if needed.

Thanks again,
Jessica

From: Said, Maria <maria_said@nps.gov>
Sent: Monday, January 21, 2019 11:16 AM
To: Smith, Jessica (CDC/DDID/NCIRD/DBD) <|yd7@cdc.gov>
Cc: Haselow, Dirk (CDC arkansas.gov) <dirk.haselow@arkansas.gov>; Kurt Kesteloot <kurt_kesteloot@nps.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Subject: Re: [EXTERNAL] Checking in re: Hot Springs

Hi Jessica,

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And we will be in touch if there are any new developments.

Best,

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Thanks and hope you all have a good weekend,

Jessica

—

Jessica C. Smith, MPH

Epidemiologist | Centers for Disease Control and Prevention

NCIRD/DBD/Respiratory Diseases Branch

404.718.5205 | lyd7@cdc.gov

--

Maria Said, MD, MHS | CDR, U.S. Public Health Service
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Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Sent: 22 Jan 2019 17:12:55 -0500
To: Said, Maria
Cc: Haselow, Dirk (CDC arkansas.gov); Kurt Kesteloot; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR); Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: RE: [EXTERNAL] Checking in re: Hot Springs

Thanks so much for the update, Maria! That is certainly reassuring.

I chatted with Jasen and Troy about this on the EH side, and we were wondering (b)(3)
(b)(3)
(b)(3) If so, were there any recommendations (b)(3)
(b)(3)

Depending (b)(3)
(b)(3)
(b)(3) Happy to discuss further anytime if needed.

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Jessica

From: Said, Maria <maria_said@nps.gov>
Sent: Monday, January 21, 2019 11:16 AM
To: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Cc: Haselow, Dirk (CDC arkansas.gov) <dirk.haselow@arkansas.gov>; Kurt Kesteloot <kurt_kesteloot@nps.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
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And we will be in touch if there are any new developments.

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Maria

On Fri, Jan 18, 2019 at 3:00 PM Said, Maria <maria_said@nps.gov> wrote:

Hi Jessica,

During the assessment, a group collected 6 liter samples (one at the cooling tower, one at the cold water pumping/gravity station, and 4 at the bathhouse) and 9 swabs. Results are still pending.

I'm very grateful for your offer to assist and will let you know when we learn more.

Best,
Maria

On Fri, Jan 18, 2019 at 2:54 PM Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

Hi Maria, Dirk and Kurt,

I wanted to check in this week about how the on-site assessment went in Hot Springs and whether the environmental results have come back or not. I don't mean to add to anyone's plate... we were just curious to hear if there are any updates. And of course we remain standing by if there's anything we can do to be of assistance.

Thanks and hope you all have a good weekend,
Jessica

—

Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NCIRD/DBD/Respiratory Diseases Branch
404.718.5205 | lyd7@cdc.gov

--

Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

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From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 21 Jan 2019 20:11:17 -0500
To: Smith, Jessica (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: RE: [EXTERNAL] Checking in re: Hot Springs

Hi Jess,

I do think it would be a good idea to follow up. Maybe (b)(5)
(b)(5) I don't need to be involved if
you want to check with NPS. (b)(5) Have a good week!

Troy

From: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Date: January 21, 2019 at 9:24:50 PM GMT-2
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>, Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>
Subject: RE: [EXTERNAL] Checking in re: Hot Springs

Hey Troy – yeah, I'm curious what the assessment revealed (b)(5)

(b)(5)

I know you're supposed to be on vacation so please enjoy it! I'll chat with Jasen about it if he has time tomorrow... I'm happy to follow up on this to ask about the findings and provide some advice if needed.

Thanks!
Jess

From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>
Sent: Monday, January 21, 2019 11:35 AM
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Subject: Fwd: [EXTERNAL] Checking in re: Hot Springs

Hey guys, see note below from Kurt. Do you think (b)(5)

(b)(5)

Troy

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Date: January 21, 2019 at 2:31:43 PM GMT-2
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>
Subject: Fwd: [EXTERNAL] Checking in re: Hot Springs

Good Morning Troy,

Thanks again for the help with this. The Legionella test results were negative and we have advised that the facility can return to normal operations.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

Attention Federal Employees Only: Please let us know how we are doing by completing a survey found at: <https://www.surveymonkey.com/s/NPS-OPH-CustServ>

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----- Forwarded message -----

From: **Said, Maria** <maria_said@nps.gov>
Date: Mon, Jan 21, 2019 at 10:16 AM
Subject: Re: [EXTERNAL] Checking in re: Hot Springs
To: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Cc: Haselow, Dirk (CDC arkansas.gov) <dirk.haselow@arkansas.gov>, Kurt Kesteloot <kurt_kesteloot@nps.gov>, Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>

Hi Jessica,

We've received results that are all negative for Legionella. We have told the Quapaw they can resume normal operations.

Thanks very much for your help with this - it is much appreciated.

And we will be in touch if there are any new developments.

Best,
Maria

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(CDC/DDNID/NCEH/DEHSP)
Subject: RE: [EXTERNAL] Checking in re: Hot Springs

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(b)(5)

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Thanks!
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(b)(5)

(b)(5)

Troy

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Thank You and Very Respectfully,

Kurt

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x]

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Date: Mon, Jan 21, 2019 at 10:16 AM
Subject: Re: [EXTERNAL] Checking in re: Hot Springs
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Cc: Haselow, Dirk (CDC arkansas.gov) <dirk.haselow@arkansas.gov>, Kurt Kesteloot <kurt_kesteloot@nps.gov>, Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>

Hi Jessica,

We've received results that are all negative for Legionella. We have told the Quapaw they can resume normal operations.

Thanks very much for your help with this - it is much appreciated.

And we will be in touch if there are any new developments.

Best,
Maria

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Thanks and hope you all have a good weekend,
Jessica

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Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NCIRD/DBD/Respiratory Diseases Branch
404.718.5705 | lyd7@cdc.gov

--

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From: Kesteloot, Kurt
Sent: 23 Jan 2019 10:54:38 -0600
To: Said, Maria
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD);Haselow, Dirk (CDC arkansas.gov);Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Terry Paul
Subject: Re: [EXTERNAL] Checking in re: Hot Springs

Good Morning Jessica,

Thanks for sharing ideas. Some initial thoughts are:

1. Flush, inspect, and clean the cooled thermal water plumbing and reservoir
2. Check air handling system
3. Coordinate a trip with the Arkansas Department of Health pool expert and others to evaluate the thermal pools/spas in the Quapaw (Conduct additional testing if deemed necessary)
4. Evaluate all fountains in the park and test if needed for Legionella
5. Address any other ideas or thoughts regarding the park hot and cooled thermal water.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
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✘

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"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

On Tue, Jan 22, 2019 at 9:32 PM Said, Maria <maria_said@nps.gov> wrote:

Thanks Jessica.

I'll defer to Kurt and am also including Terry Paul from the Arkansas Dept of Health, as they can speak much better than I about the environmental assessment and how to optimize conditions moving forward.

And from me -- another thank you to Arkansas for all your assistance with the assessment and testing. It is very much appreciated.

Best,
Maria

On Tue, Jan 22, 2019 at 5:13 PM Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

Thanks so much for the update, Maria! That is certainly reassuring.

I chatted with Jasen and Troy about this on the EH side, and we were wondering (b)(3)
(b)(3)
(b)(3) If so, were there any
recommendations (b)(3)
(b)(3)

Depending (b)(3)
(b)(3)
(b)(3) Happy to discuss further anytime if needed.

Thanks again,
Jessica

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Sent: Monday, January 21, 2019 11:16 AM
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Cc: Haselow, Dirk (CDC arkansas.gov) <dirk.haselow@arkansas.gov>; Kurt Kesteloot <kurt_kesteloot@nps.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
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Thanks and hope you all have a good weekend,

Jessica

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Jessica C. Smith, MPH

Epidemiologist | Centers for Disease Control and Prevention

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Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Kesteloot, Kurt
Sent: 10 Jul 2019 21:56:49 -0500
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Cc: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis
CDC49130

Hi Troy,

Thanks, I will try to call you tomorrow morning to share thoughts and we hope to have a call with Laura and others later.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

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On Wed, Jul 10, 2019 at 8:32 PM Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
<tir4@cdc.gov> wrote:

Hi Kurt,

I'm happy to speak with you in the morning. Feel free to give me a call at your convenience. I have another call from 10-1030 am but otherwise available. My cell is

(b)(6)

It looks like you've also reached out to Laura Cooley, which is good. I need to make sure that I'm coordinating with other members of the CDC team before giving any formal advice. However, I'm happy to talk with you informally and then loop in others as needed.

Troy

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From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, July 10, 2019 7:27 PM
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: Fwd: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130

Good Evening Troy,

Are you available for a call? Early tomorrow morning is best for me.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
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Email: Kurt_Kesteloot@nps.gov

✘

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----- Forwarded message -----

From: **Said, Maria** <maria_said@nps.gov>
Date: Wed, Jul 10, 2019 at 6:03 PM
Subject: Fwd: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130
To: Cooley, Laura A. (CDC/OID/NCIRD) <whz3@cdc.gov>
Cc: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Hi Laura,

Are you available to discuss this? I'm around tonight and early tomorrow morning - I'll be in clinic from 8:30am-12:30pm tomorrow but free after that.

Thank you!
Maria

----- Forwarded message -----

From: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Date: Wed, Jul 10, 2019 at 5:26 PM
Subject: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130
To: Brandi.Stricklin@arkansas.gov
<Brandi.Stricklin@arkansas.gov>, CATHERINE.WATERS@ARKANSAS.GOV
<CATHERINE.WATERS@arkansas.gov>, Debbie.Pledger@arkansas.gov
<Debbie.Pledger@arkansas.gov>, Haselow, Dirk (CDCarkansas.gov)
<dirk.haselow@arkansas.gov>, Wheeler, Gary (CDCarkansas.gov)
<gary.wheeler@arkansas.gov>, Safi, Haytham (CDCarkansas.gov)
<haytham.safi@arkansas.gov>, Michael.Cima@arkansas.gov
<Michael.Cima@arkansas.gov>
Cc: NCID DBMD Travel-Legionella (CDC)
<travellegionella@cdc.gov>, maria_said@nps.gov <maria_said@nps.gov>

Dear Colleague(s):

Please see the attached notification regarding a case of Legionnaires' disease that may be travel-associated. This patient had exposure to the Quapaw Baths & Spa. We are aware of 2 additional cases with exposure to this location within the past year
(b)(6) I have requested MS to obtain the lower respiratory specimen, if available. Please see below for hot tub guidance:

Hot tub guidance:

- CDC webpage for water system maintenance and operating public hot tubs: <http://www.cdc.gov/legionella/water-system-maintenance.html>
- CDC fact sheet for disinfecting hot tubs containing *Legionella*:
<http://www.cdc.gov/legionella/downloads/hot-tub-disinfection.pdf>
- Hot tub maintenance fact sheet: <http://www.cdc.gov/healthywater/pdf/swimming/resources/operating-public-hot-tubs-factsheet.pdf>

Thanks,
Sooji

—

Sooji Lee, MS, MSPH

Epidemiologist (IHRC, Inc.)

Legionella Team (NCIRD/DBD/RDB)

Centers for Disease Control and Prevention

1600 Clifton Road, MS 1124-6 | Atlanta, GA 30329

Phone: 404-718-3192 | Email: slee7@cdc.gov

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From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 11 Jul 2019 01:31:28 +0000
To: Kesteloot, Kurt
Cc: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis
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To: Cooley, Laura A. (CDC/OID/NCIRD) <whz3@cdc.gov>

Cc: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

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Subject: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130

To: Brandi.Stricklin@arkansas.gov

<Brandi.Stricklin@arkansas.gov>, CATHERINE.WATERS@ARKANSAS.GOV

<CATHERINE.WATERS@arkansas.gov>, Debbie.Pledger@arkansas.gov

<Debbie.Pledger@arkansas.gov>, Haselow, Dirk (CDCarkansas.gov)

<dirk.haselow@arkansas.gov>, Wheeler, Gary (CDCarkansas.gov)

<gary.wheeler@arkansas.gov>, Safi, Haytham (CDCarkansas.gov)

<haytham.safi@arkansas.gov>, Michael.Cima@arkansas.gov

<Michael.Cima@arkansas.gov>

Cc: NCID DBMD Travel-Legionella (CDC)

<travellegionella@cdc.gov>, maria_said@nps.gov <maria_said@nps.gov>

Dear Colleague(s):

Please see the attached notification regarding a case of Legionnaires' disease that may be travel-associated. This patient had exposure to the Quapaw Baths & Spa. We are aware of 2 additional cases with exposure to this location within the past year (b)(6)

(b)(6)

have requested MS to obtain the lower respiratory specimen, if available.

Please see below for hot tub guidance:

Hot tub guidance:

- CDC webpage for water system maintenance and operating public hot tubs:<http://www.cdc.gov/legionella/water-system-maintenance.html>
- CDC fact sheet for disinfecting hot tubs containing *Legionella*:
<http://www.cdc.gov/legionella/downloads/hot-tub-disinfection.pdf>
- Hot tub maintenance fact sheet:<http://www.cdc.gov/healthywater/pdf/swimming/resources/operating-public-hot-tubs-factsheet.pdf>

Thanks,

Sooji

—

Sooji Lee, MS, MSPH

Epidemiologist (IIIRC, Inc.)

Legionella Team (NCIRD/DBD/ROB)

Centers for Disease Control and Prevention

1600 Clifton Road, NE 1124-6 | Atlanta, GA 30329

Phone: 404-718-3192 | slee7@cdc.gov

--

Maria Said, MD, MIIS CDR, U.S. Public Health Service

Epidemiology Branch Chief Office of Public Health National Park Service

Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 Washington, DC 20240

Office Tel: 202-513-7151 | Email: maria_said@nps.gov

Website (public): <https://www.nps.gov/orgs/1878/index.htm>

Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 11 Jul 2019 04:03:55 +0000
To: Kesteloot, Kurt
Cc: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130

That sounds good, Kurt. I look forward to talking with you.

Troy

Get [Outlook for iOS](#)

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, July 10, 2019 9:56:49 PM
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Cc: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130

Hi Troy,

Thanks, I will try to call you tomorrow morning to share thoughts and we hope to have a call with Laura and others later.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✘

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

On Wed, Jul 10, 2019 at 8:32 PM Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
<tir4@cdc.gov> wrote:

Hi Kurt,

I'm happy to speak with you in the morning. Feel free to give me a call at your convenience. I have another call from 10-1030 am but otherwise available. My cell is

(b)(6)

It looks like you've also reached out to Laura Cooley, which is good. I need to make sure that I'm coordinating with other members of the CDC team before giving any formal advice. However, I'm happy to talk with you informally and then loop in others as needed.

Troy

Get [Outlook for iOS](#)

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Sent: Wednesday, July 10, 2019 7:27 PM

To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)

Subject: Fwd: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130

Good Evening Troy,

Are you available for a call? Early tomorrow morning is best for me.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
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Email: Kurt_Kesteloot@nps.gov

✘

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

----- Forwarded message -----

From: **Said, Maria** <maria_said@nps.gov>

Date: Wed, Jul 10, 2019 at 6:03 PM

Subject: Fwd: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130

To: Cooley, Laura A. (CDC/OID/NCIRD) <whz3@cdc.gov>

Cc: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Hi Laura,

Are you available to discuss this? I'm around tonight and early tomorrow morning - I'll be in clinic from 8:30am-12:30pm tomorrow but free after that.

Thank you!

Maria

----- Forwarded message -----

From: **Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)**<npf3@cdc.gov>

Date: Wed, Jul 10, 2019 at 5:26 PM

Subject: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130

To: Brandi.Stricklin@arkansas.gov

<Brandi.Stricklin@arkansas.gov>, CATHERINE.WATERS@ARKANSAS.GOV

<CATHERINE.WATERS@arkansas.gov>, Dcbbic.Pledger@arkansas.gov

<Dcbbic.Pledger@arkansas.gov>, Haselow, Dirk (CDCarkansas.gov)

<dirk.haselow@arkansas.gov>, Wheeler, Gary (CDCarkansas.gov)

<gary.wheeler@arkansas.gov>, Safi, Haytham (CDCarkansas.gov)

<haytham.safi@arkansas.gov>, Michael.Cima@arkansas.gov

<Michael.Cima@arkansas.gov>

Cc: NCID DBMD Travel-Legionella (CDC)

<travellegionella@cdc.gov>, maria_said@nps.gov <maria_said@nps.gov>

Dear Colleague(s):

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(b)(6) I have requested MS to obtain the lower respiratory specimen, if available. Please see below for hot tub guidance:

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Thanks,
Sooji

—

Sooji Lee, MS, MSPH

Epidemiologist (IHRC, Inc.)

Legionella Team (NCIRD/DBD/RDB)

Centers for Disease Control and Prevention

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Phone: 404-718-3192 | Email: slee7@cdc.gov

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
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Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Said, Maria
Sent: 17 Oct 2019 10:53:52 -0400
To: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Cc: Kurt Kesteloot; Scott, Mark; Sara Newman; Miller, Laura; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR); Lucas, Claessa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] RE: Hot Springs - Culture results

Great - I'll send out a calendar invite so folks can block it off and leave the Webex/call-in information blank until we set that up.

Maria

On Thu, Oct 17, 2019 at 10:43 AM Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

10:00 am ET still works for the CDC team. I'll block it on our calendars. Thanks!

From: Kurt Kesteloot <kurt_kesteloot@nps.gov>
Sent: Thursday, October 17, 2019 10:34 AM
To: Scott, Mark <mark_scott@nps.gov>; Said, Maria <maria_said@nps.gov>
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Sara Newman <sara_newman@nps.gov>; Miller, Laura <laura_a_miller@nps.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Lucas, Claessa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>
Subject: Re: [EXTERNAL] RE: Hot Springs - Culture results

Hi Maria,

The 1000 am Eastern time sounds great for me. If that works for everyone else, I am happy to set a Webex and meeting invite later this evening.

Very Respectfully,

CDR Kurt Kesteloot, PE, BCEE, USPHS

Supervisory Public Health Consultant, Interior Regions 3-5

National Park Service, Office of Public Health

601 Riverfront Drive

Omaha, NE 68102

Office Phone: 402-661-1718

Cell Phone: 202-641-0055

Sent from my iPhone

On Oct 17, 2019, at 8:10 AM, Scott, Mark <mark_scott@nps.gov> wrote:

Anytime Friday works for me. Thanks

Mark

On Thu, Oct 17, 2019 at 8:09 AM Said, Maria <maria_said@nps.gov> wrote:

Laura, Kurt, and Mark,

Is there a time on Friday that works better for you both?

Thanks.

Maria

On Wed, Oct 16, 2019 at 2:02 PM Said, Maria <maria_said@nps.gov> wrote:

I can be there for any of those times. Thanks Jessica.

Maria

On Wed, Oct 16, 2019 at 1:34 PM Smith, Jessica
(CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

Hi NPS colleagues,

Currently it looks like we're free for a follow-up call on Friday, 10/18 at 10 am and 12 pm ET. We may be able to make 2 pm work as well, I just need to confirm with Claressa when she's back in office tomorrow am. Please let me know if any of those times work for you... if not we can move things around as needed to accommodate.

Thanks,
Jessica

Jessica C. Smith, MPH

Epidemiologist | Centers for Disease Control and Prevention

NCIRD/DBD/Respiratory Diseases Branch

404.718.5205 | lyd7@cdc.gov

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, October 16, 2019 10:06 AM
To: Said, Maria <maria_said@nps.gov>
Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Miller, Laura <laura_a_miller@nps.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Sara Newman <sara_newman@nps.gov>; Mark Scott <Mark_Scott@nps.gov>
Subject: Re: [EXTERNAL] RE: Hot Springs - Culture results

Thanks Maria and Everyone,

I have actually already sent a meeting invite with the following number.

1-877-951-8306 access code 9958772

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

×

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

On Wed, Oct 16, 2019 at 9:03 AM Said, Maria
<maria_said@nps.gov> wrote:

Great -- thank you all for making the time.

Kurt, Laura, and I can all be on a call at 10am CT/11am ET.

Here is conference line info - 1-866-723-8146 PC 7713400.
I'll send out a calendar invite too.

Maria

On Wed, Oct 16, 2019 at 10:01 AM Lee, Sooji
(CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov> wrote:

Hello everyone,

I am sorry for the confusion. **CDC team is available 10am central today.**

Thank you,

Sooji

From: Miller, Laura <laura_a_miller@nps.gov>
Sent: Wednesday, October 16, 2019 9:44 AM
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Cc: Kesteloot, Kurt <kurt_kesteloot@nps.gov>; Said, Maria <maria_said@nps.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Sara Newman <sara_newman@nps.gov>; Mark Scott <Mark_Scott@nps.gov>
Subject: Re: [EXTERNAL] RE: Hot Springs - Culture results

I can make 1:00 pm CDT.

Laura

On Wed, Oct 16, 2019 at 8:36 AM Lee, Sooji
(CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
wrote:

Hi Kurt,

It looks like some of our colleagues have a meeting at 10am central. Is there another time that may work for your team today? We have availability 1pm, and 3pm central today.

Best,

Sooji

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, October 16, 2019 8:48 AM
To: Said, Maria <maria_said@nps.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Cc: Laura Miller <laura_a_miller@nps.gov>; Sara Newman <sara_newman@nps.gov>; Mark Scott <Mark_Scott@nps.gov>
Subject: Re: Hot Springs - Culture results

Good Morning Everyone,

Are you available around 10 a.m. central time for a call? If so, I can send a meeting invite.

Also, I have attached water use and temperatures for our discussion.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions
3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

On Wed, Oct 16, 2019 at 6:24 AM Kesteloot, Kurt
<kurt_kesteloot@nps.gov> wrote:

Good Morning Everyone,

I emailed the lab last night requesting the temperatures. I know Mark Scott was present when samples were taken. I believe he mentioned that all samples had a temperature except the cooled thermal water reservoir.

I also requested the water meter readings for each facility. The park has water meter readings for both the cooled and hot thermal water at each location. I look forward to talking to everyone soon. I am open up to 1330 eastern time today.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior
Regions 3-5
National Park Service, Office of Public Health
(OPH),
601 Riverfront Drive
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Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

On Tue, Oct 15, 2019 at 9:21 PM Said, Maria
<maria_said@nps.gov> wrote:

Hi everyone,

We have received results of the Legionella testing at Hot Springs (attached).

Would you all have availability tomorrow to discuss?

We are not sure what to make of the detection in the hot samples (and can see if they have temperature readings from those water samples to

see what the temperature actually was). We also are not sure what to make of the TimeZero vs. Standard ISO results.

Thank you as always for your help sorting through this. It is very much appreciated.

Maria

--

Laura A. Miller

Superintendent

Hot Springs National Park

101 Reserve Street

Hot Springs, AR 71901

501.623.2824

870.302.9250 (cell)

501.624.1037 (fax)

www.nps.gov/hosp

✕

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health |
National Park Service

Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 Washington, DC 20240

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
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--

Mark C. Scott

Facility Manager

Hot Springs National Park

631 Whittington Ave.

Hot Springs, AR 71901

(501)620-6861

--

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From: Kurt Kesteloot
Sent: 17 Oct 2019 07:34:02 -0700
To: Scott, Mark; Said, Maria
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD); Sara Newman; Miller, Laura; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR); Lucas, Claressa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] RE: Hot Springs - Culture results

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Jessica

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Jessica C. Smith, MPH

Epidemiologist | Centers for Disease Control and Prevention

NC RD/D3D/Respiratory Diseases Branch

404.718.5205 | lyd7@cdc.gov

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(CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy

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Email: Kurt_Kesteloot@nps.gov

×

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

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Maria

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To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Cc: Kesteloot, Kurt <kurt_kesteloot@nps.gov>; Said, Maria <maria_said@nps.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <ch19@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Sara Newman <sara_newman@nps.gov>; Mark Scott <Mark_Scott@nps.gov>
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Laura

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To: Said, Maria <maria_said@nps.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
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Office Phone: 1-402-661-1718
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Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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Office Tel: 202-513-7151 | Email: maria_said@nps.gov

Website (public): <https://www.nps.gov/orgs/1878/index.htm>

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From: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Sent: 16 Oct 2019 17:31:13 +0000
To: Kesteloot, Kurt;Said, Maria;Sara Newman;Mark Scott;Miller, Laura
Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR);Lucas, Claressa (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: RE: [EXTERNAL] RE: Hot Springs - Culture results

Hi NPS colleagues,

Currently it looks like we're free for a follow-up call on Friday, 10/18 at 10 am and 12 pm ET. We may be able to make 2 pm work as well, I just need to confirm with Claressa when she's back in office tomorrow am. Please let me know if any of those times work for you... if not we can move things around as needed to accommodate.

Thanks,
Jessica

—

Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NC RD/D3D/Respiratory Diseases Branch
404.718.5205 | lyd7@cdc.gov

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, October 16, 2019 10:06 AM
To: Said, Maria <maria_said@nps.gov>
Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Miller, Laura <laura_a_miller@nps.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Sara Newman <sara_newman@nps.gov>; Mark Scott <Mark_Scott@nps.gov>
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Thank You and Very Respectfully,

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To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
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We are not sure what to make of the detection in the hot samples (and can see if they have temperature readings from those water samples to see what the temperature actually was). We also are not sure what to make of the TimeZero vs. Standard ISO results.

Thank you as always for your help sorting through this. It is very much appreciated.

Maria

--

Laura A. Miller

Superintendent

Hot Springs National Park

101 Reserve Street

Hot Springs, AR 71901

501.623.2824

870.302.9250 (cell)

501.624.1037 (fax)

www.nps.gov/hosp

✕

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Maria Said, MD, MHS | CDR, U.S. Public Health Service

Epidemiology Branch Chief | Office of Public Health | National Park Service

Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 Washington, DC 20240

Office Tel: 202-513-7151 | Email: maria_said@nps.gov

Website (public): <https://www.nps.gov/orgs/1878/index.htm>

Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

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Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Said, Maria
Sent: 16 Oct 2019 10:03:45 -0400
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
Cc: Miller, Laura;Kesteloot, Kurt;Smith, Jessica (CDC/DDID/NCIRD/DBD);Lucas, Claressa (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Sara Newman;Mark Scott
Subject: Re: [EXTERNAL] RE: Hot Springs - Culture results

Great -- thank you all for making the time.
Kurt, Laura, and I can all be on a call at 10am CT/11am ET.
Here is conference line info - 1-866-723-8146 PC 7713400. I'll send out a calendar invite too.
Maria

On Wed, Oct 16, 2019 at 10:01 AM Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov> wrote:

Hello everyone,

I am sorry for the confusion. **CDC team is available 10am central today.**

Thank you,

Sooji

From: Miller, Laura <laura_a_miller@nps.gov>
Sent: Wednesday, October 16, 2019 9:44 AM
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Cc: Kesteloot, Kurt <kurt_kesteloot@nps.gov>; Said, Maria <maria_said@nps.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Sara Newman <sara_newman@nps.gov>; Mark Scott <Mark_Scott@nps.gov>
Subject: Re: [EXTERNAL] RE: Hot Springs - Culture results

I can make 1:00 pm CDT.

Laura

On Wed, Oct 16, 2019 at 8:36 AM Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov> wrote:

Hi Kurt,

It looks like some of our colleagues have a meeting at 10am central. Is there another time that may work for your team today? We have availability 1pm, and 3pm central today.

Best,

Sooji

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, October 16, 2019 8:48 AM
To: Said, Maria <maria_said@nps.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Cc: Laura Miller <laura_a_miller@nps.gov>; Sara Newman <sara_newman@nps.gov>; Mark Scott <Mark_Scott@nps.gov>
Subject: Re: Hot Springs - Culture results

Good Morning Everyone,

Are you available around 10 a.m. central time for a call? If so, I can send a meeting invite.

Also, I have attached water use and temperatures for our discussion.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

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On Wed, Oct 16, 2019 at 6:24 AM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:

Good Morning Everyone,

I emailed the lab last night requesting the temperatures. I know Mark Scott was present when samples were taken. I believe he mentioned that all samples had a temperature except the cooled thermal water reservoir.

I also requested the water meter readings for each facility. The park has water meter readings for both the cooled and hot thermal water at each location. I look forward to talking to everyone soon. I am open up to 1330 eastern time today.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
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Omaha, NE 68102
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Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

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On Tue, Oct 15, 2019 at 9:21 PM Said, Maria <maria_said@nps.gov> wrote:

Hi everyone,

We have received results of the Legionella testing at Hot Springs (attached).

Would you all have availability tomorrow to discuss?

We are not sure what to make of the detection in the hot samples (and can see if they have temperature readings from those water samples to see what the temperature actually was). We also are not sure what to make of the TimeZero vs. Standard ISO results.

Thank you as always for your help sorting through this. It is very much appreciated.

Maria

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Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Sent: 23 Oct 2019 12:59:26 +0000
To: Scott, Mark;Kesteloot, Kurt
Cc: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Said, Maria
Subject: Re: [EXTERNAL] Time to talk

I can do anytime until noon today.

From: Scott, Mark <mark_scott@nps.gov>
Sent: Wednesday, October 23, 2019 8:17:44 AM
To: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Cc: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Said, Maria <maria_said@nps.gov>
Subject: Re: [EXTERNAL] Time to talk

I will make time, just let me know.

Mark

On Wed, Oct 23, 2019 at 7:09 AM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:
Hi Jasen,

Great! Does 0930 or 1000 ET work for everyone? If so, I will set up a WebEx so we can talk about additional testing thoughts for the water system at Hot Springs National Park.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
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601 Riverfront Drive
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Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

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the parks that we share." GREEN DOT

On Wed, Oct 23, 2019 at 7:01 AM Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
<izk0@cdc.gov> wrote:

Kurt,

I got your message. I am free starting at 930 AM ET until noon today. I can't see Jessica or Troy's schedule but I imagine something is open during that time for them. Jess or Troy do any of these times work?

Kurt do any of these times work for you? I am starting my commute now.

Jasen

Sent from iPhone

--

Mark C. Scott
Facility Manager
Hot Springs National Park
631 Whittington Ave.
Hot Springs, AR 71901
(501)620-6861

From: Scott, Mark
Sent: 23 Oct 2019 07:17:44 -0500
To: Kesteloot, Kurt
Cc: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Smith, Jessica (CDC/DDID/NCIRD/DBD);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Said, Maria
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Jasen

Sent from iPhone

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Mark C. Scott
Facility Manager
Hot Springs National Park
631 Whittington Ave.
Hot Springs, AR 71901
(501)620-6861

From: Kesteloot, Kurt
Sent: 23 Oct 2019 07:09:08 -0500
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD); Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Said, Maria; Mark Scott
Subject: Re: [EXTERNAL] Time to talk

Hi Jasen,

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Thank You and Very Respectfully,

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Jasen

Sent from iPhone

From: Kesteloot, Kurt
Sent: 23 Oct 2019 08:26:42 -0500
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD); Scott, Mark; Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Said, Maria
Subject: Re: [EXTERNAL] Time to talk

Good Morning Everyone,

Thank you for agreeing to meet on short notice. I am in the process of sending a WebEx meeting invite now. If you do not receive an invite in the next 15 minutes, please let me know and I can forward the invite directly from me versus the system.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
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On Wed, Oct 23, 2019 at 8:20 AM Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov> wrote:

Kurt feel free to send the invite for 10.

Sent from iPhone

From: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Sent: Wednesday, October 23, 2019 8:59:26 AM
To: Scott, Mark <mark_scott@nps.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Cc: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy

(CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Said, Maria <maria_said@nps.gov>
Subject: Rc: [EXTERNAL] Time to talk

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From: Scott, Mark <mark_scott@nps.gov>
Sent: Wednesday, October 23, 2019 8:17:44 AM
To: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Cc: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Said, Maria <maria_said@nps.gov>
Subject: Re: [EXTERNAL] Time to talk

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Kurt

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On Wed, Oct 23, 2019 at 7:01 AM Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
<izk0@cdc.gov> wrote:

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Kurt do any of these times work for you? I am starting my commute now.

Jasen

Sent from iPhone

--

Mark C. Scott
Facility Manager
Hot Springs National Park
631 Whittington Ave.
Hot Springs, AR 71901
(501)620-6861

From: Kesteloot, Kurt
Sent: 25 Nov 2019 09:56:27 -0600
To: Lucas, Claressa (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Miller, Laura;Smith, Jessica (CDC/DDID/NCIRD/DBD);Said, Maria;Mark Scott;Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Tracy Simmons;Tricia Horn;Alexandra Picavet;Robert Bryson;Peter Budde
Cc: Sara Newman;Herbert Frost;Patricia Trap
Subject: Re: Call to Discuss The Latest Legionella Test Results from Arkansas?

Thank you for the responses everyone. It looks like tomorrow at 3 p.m. Eastern/ 2 p.m. Central time will be best. I will send a meeting invite for that time. If you cannot make that time, please let me know and I will try to call you to get your thoughts before the call.

Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3, 4, and 5, Great Lakes, Mississippi Basin, and Missouri Basin
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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On Mon, Nov 25, 2019 at 8:11 AM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:
Good Morning Everyone,

Is there a good time to have a call today or tomorrow regarding the latest test results from Hot Springs, AR? Ultimately, there was one positive sample. That sample came from a long waterline that was flushed but has had little to no use over the last several years. So, I believe the flushing has shown to be one effective step in lowering the risk

of Legionella in the water. It would be great to talk to other experts from CDC to hear your perspective.

It would also be great to talk about a press release on the latest round of test results.

There are several other questions to ask and discuss.

On the call I would like to discuss the following:

1. The latest test results and procedure for sampling prior to sampling
2. A list of questions I have
3. Press release information
4. Any additional questions or public health concerns
5. Long-Term plans for drinking water and recreational water
6. Planning for a call with the State Health Department

I look forward to connecting with everyone soon and appreciate any collaboration on this important National Park resource and public health matter.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3, 4, and 5, Great Lakes,
Mississippi Basin, and Missouri Basin
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
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Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

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From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 25 Nov 2019 15:24:06 +0000
To: Smith, Jessica (CDC/DDID/NCIRD/DBD);Kesteloot, Kurt
Cc: Lucas, Claressa (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Said, Maria;Mark Scott;Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR);Tracy Simmons;Tricia Horn;Robert Bryson;Peter Budde;Sara Newman;Herbert Frost;Patricia Trap;Picavet, Alexandra;Miller, Laura
Subject: Re: Call to Discuss The Latest Legionella Test Results from Arkansas?

Tomorrow between 10-11 am would work best for me.

Troy

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From: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Sent: Monday, November 25, 2019 9:44:15 AM
To: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Cc: Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Said, Maria <maria_said@nps.gov>; Mark Scott <mark_scott@nps.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Tracy Simmons <tracy_simmons@nps.gov>; Tricia Horn <tricia_horn@nps.gov>; Robert Bryson <robert_bryson@nps.gov>; Peter Budde <peter_budde@nps.gov>; Sara Newman <sara_newman@nps.gov>; Herbert Frost <bert_frost@nps.gov>; Patricia Trap <Patricia_Trap@nps.gov>; Picavet, Alexandra <alexandra_picavet@nps.gov>; Miller, Laura <laura_a_miller@nps.gov>
Subject: RE: Call to Discuss The Latest Legionella Test Results from Arkansas?

Good morning Kurt,

From the CDC side, Claressa and I are available this afternoon between 2:00-5:00 pm and tomorrow from either 10:00-11:00 am or between 1:00-5:00 pm (all times ET). I know Jasen is out of office this week but I'm not sure about Troy's availability.

Thanks,
Jessica

—

Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NCIRD/DBD/Respiratory Diseases Branch
404.718.5205 | lyd7@cdc.gov

From: Picavet, Alexandra <alexandra_picavet@nps.gov>
Sent: Monday, November 25, 2019 9:35 AM
To: Miller, Laura <laura_a_miller@nps.gov>
Cc: Kesteloot, Kurt <kurt_kesteloot@nps.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Smith, Jessica

(CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Said, Maria <maria_said@nps.gov>; Mark Scott <mark_scott@nps.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Tracy Simmons <tracy_simmons@nps.gov>; Tricia Horn <tricia_horn@nps.gov>; Robert Bryson <robert_bryson@nps.gov>; Peter Budde <peter_budde@nps.gov>; Sara Newman <sara_newman@nps.gov>; Herbert Frost <bert_frost@nps.gov>; Patricia Trap <Patricia_Trap@nps.gov>

Subject: Re: Call to Discuss The Latest Legionella Test Results from Arkansas?

I am available.

Alexandra Picavet
Chief of Communications, Legislative Affairs and Partnerships
DOI Regions 3, 4, 5
National Park Service
402-661-1840 (office)
alexandra_picavet@nps.gov
www.nps.gov/

On Mon, Nov 25, 2019 at 8:17 AM Miller, Laura <laura_a_miller@nps.gov> wrote:

Hey Kurt,

Mark is out this week, but I'm here and can be available today or tomorrow. I do have two calls scheduled for today - at 10:15 am CST and at 1:00 pm CST - otherwise I'm free. Tomorrow is completely free.

Thanks!
Laura

On Mon, Nov 25, 2019 at 8:12 AM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:

Good Morning Everyone,

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Email: Kurt_Kesteloot@nps.gov

x]

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Laura A. Miller
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870.302.9250 (cell)
501.624.1037 (fax)
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x]

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Sent: 25 Nov 2019 14:44:15 +0000
To: Kesteloot, Kurt
Cc: Lucas, Claressa (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Said, Maria;Mark Scott;Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Tracy Simmons;Tricia Horn;Robert Bryson;Peter Budde;Sara Newman;Herbert Frost;Patricia Trap;Picavet, Alexandra;Miller, Laura
Subject: RE: Call to Discuss The Latest Legionella Test Results from Arkansas?

Good morning Kurt,

From the CDC side, Claressa and I are available this afternoon between 2:00-5:00 pm and tomorrow from either 10:00-11:00 am or between 1:00-5:00 pm (all times ET). I know Jasen is out of office this week but I'm not sure about Troy's availability.

Thanks,
Jessica

—

Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NC RD/D3D/Respiratory Diseases Branch
404.718.5205 | lyd7@cdc.gov

From: Picavet, Alexandra <alexandra_picavet@nps.gov>
Sent: Monday, November 25, 2019 9:35 AM
To: Miller, Laura <laura_a_miller@nps.gov>
Cc: Kesteloot, Kurt <kurt_kesteloot@nps.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <ch19@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Said, Maria <maria_said@nps.gov>; Mark Scott <mark_scott@nps.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Tracy Simmons <tracy_simmons@nps.gov>; Tricia Horn <tricia_horn@nps.gov>; Robert Bryson <robert_bryson@nps.gov>; Peter Budde <peter_budde@nps.gov>; Sara Newman <sara_newman@nps.gov>; Herbert Frost <bert_frost@nps.gov>; Patricia Trap <Patricia_Trap@nps.gov>
Subject: Re: Call to Discuss The Latest Legionella Test Results from Arkansas?

I am available.

Alexandra Picavet
Chief of Communications, Legislative Affairs and Partnerships
DOI Regions 3, 4, 5
National Park Service
402-661-1840 (office)
alexandra_picavet@nps.gov
www.nps.gov/

On Mon, Nov 25, 2019 at 8:17 AM Miller, Laura <laura_a_miller@nps.gov> wrote:

Hey Kurt,

Mark is out this week, but I'm here and can be available today or tomorrow. I do have two calls scheduled for today - at 10:15 am CST and at 1:00 pm CST - otherwise I'm free. Tomorrow is completely free.

Thanks!
Laura

On Mon, Nov 25, 2019 at 8:12 AM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:

Good Morning Everyone,

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2. A list of questions I have
3. Press release information
4. Any additional questions or public health concerns
5. Long-Term plans for drinking water and recreational water
6. Planning for a call with the State Health Department

I look forward to connecting with everyone soon and appreciate any collaboration on this important National Park resource and public health matter.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3, 4, and 5, Great Lakes, Mississippi Basin, and Missouri Basin
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive

Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

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--

Laura A. Miller
Superintendent
Hot Springs National Park
101 Reserve Street
Hot Springs, AR 71901
501.623.2824
870.302.9250 (cell)
501.624.1037 (fax)
www.nps.gov/hosp

x]

From: Frost, Herbert
Sent: 25 Nov 2019 08:42:50 -0600
To: Miller, Laura
Cc: Kesteloot, Kurt; Lucas, Claressa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Smith, Jessica (CDC/DDID/NCIRD/DBD); Said, Maria; Mark Scott; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR); Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Tracy Simmons; Tricia Horn; Alexandra Picavet; Robert Bryson; Peter Budde; Sara Newman; Patricia Trap
Subject: Re: Call to Discuss The Latest Legionella Test Results from Arkansas?

I am around through Wed.

Bert

- - - -

Herbert C. Frost, Ph.D., Regional Director
National Park Service
Interior Region 3 (Great Lakes): Region 4 (Mississippi Basin): Region 5 (Missouri Basin)
602 Riverfront Drive
Omaha, NE 68102

402-661-1520 - Office

On Mon, Nov 25, 2019 at 8:17 AM Miller, Laura <laura_a_miller@nps.gov> wrote:
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Thanks!
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Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3, 4, and 5, Great Lakes,
Mississippi Basin, and Missouri Basin
National Park Service, Office of Public Health (OPII),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

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--

Laura A. Miller
Superintendent
Hot Springs National Park
101 Reserve Street
Hot Springs, AR 71901
501.623.2824
870.302.9250 (cell)
501.624.1037 (fax)
www.nps.gov/hosp

From: Picavet, Alexandra
Sent: 25 Nov 2019 08:35:16 -0600
To: Miller, Laura
Cc: Kesteloot, Kurt; Lucas, Claressa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Smith, Jessica (CDC/DDID/NCIRD/DBD); Said, Maria; Mark Scott; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR); Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Tracy Simmons; Tricia Horn; Robert Bryson; Peter Budde; Sara Newman; Herbert Frost; Patricia Trap
Subject: Re: Call to Discuss The Latest Legionella Test Results from Arkansas?

I am available.

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Thank You and Very Respectfully,

Kurt

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National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
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101 Reserve Street
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870.302.9250 (cell)
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✕

From: Miller, Laura
Sent: 25 Nov 2019 08:17:02 -0600
To: Kesteloot, Kurt
Cc: Lucas, Claressa (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Smith, Jessica (CDC/DDID/NCIRD/DBD);Said, Maria;Mark Scott;Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Tracy Simmons;Tricia Horn;Alexandra Picavet;Robert Bryson;Peter Budde;Sara Newman;Herbert Frost;Patricia Trap
Subject: Re: Call to Discuss The Latest Legionella Test Results from Arkansas?

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Thank You and Very Respectfully,

Kurt

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✕

From: Said, Maria
Sent: 26 Nov 2019 10:00:25 -0500
To: Kesteloot, Kurt
Cc: Lucas, Claressa (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Miller, Laura;Smith, Jessica (CDC/DDID/NCIRD/DBD);Mark Scott;Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Tracy Simmons;Tricia Horn;Alexandra Picavet;Robert Bryson;Peter Budde;Sara Newman;Herbert Frost;Patricia Trap;Gwendolyn Ruppert
Subject: Re: Call to Discuss The Latest Legionella Test Results from Arkansas?

Hi all,

I won't be able to join the call this afternoon but will stay informed about what you all talk about.

Kurt, I think your agenda for the meeting looks really good. A couple of additional questions I have are:

- 1) What should water management plans look like? Should they include legionella testing and if so, how frequently? And what, typically, is the appropriate response to positive legionella culture results that might be identified during legionella testing as part of a water management plan? My understanding is that the response is different in terms of public notification than it would be in the context of human cases or an outbreak.
- 2) What are good ways to describe the difference between PCR positivity and culture positivity in a press release without actually talking about PCR and culture? I think we want to relay to the public that this is natural water and that there may be risk/bacteria present, BUT that with good water management that includes flow, high temperature or whatever, the bacteria are not viable and should not present a public health risk.

I am available Wednesday and probably Friday to help with a press release if needed. I'm adding Gwen Ruppert to the chain -- she is a CDC Public Health Associate who is with us in the NPS Office of Public Health for the year and will join the call this afternoon.

Thank you!
Maria

On Mon, Nov 25, 2019 at 10:57 AM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:
Thank you for the responses everyone. It looks like tomorrow at 3 p.m. Eastern/ 2 p.m. Central time will be best. I will send a meeting invite for that time. If you cannot make that time, please let me know and I will try to call you to get your thoughts before the call.

Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS

Supervisory Public Health Consultant, Interior Regions 3, 4, and 5, Great Lakes,
Mississippi Basin, and Missouri Basin
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
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Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

×

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On Mon, Nov 25, 2019 at 8:11 AM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:
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I look forward to connecting with everyone soon and appreciate any collaboration on this important National Park resource and public health matter.

Thank You and Very Respectfully,

Kurt

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✘

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Sent: 1 Oct 2019 16:51:29 +0000
To: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Lucas, Claressa (CDC/DDID/NCIRD/DBD)
Subject: RE: Hot Springs and Water management plans

Yeah, and [redacted] (b)(3)
[redacted] (b)(3)

From: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>
Sent: Tuesday, October 1, 2019 12:49 PM
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

I think [redacted] (b)(3)
[redacted] (b)(3)

From: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>
Sent: Tuesday, October 1, 2019 12:29 PM
To: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Super helpful. [redacted] (b)(3)
[redacted] (b)(3)
[redacted] (b)(3) Are others interpreting this the same?

[redacted] (b)(3)

(b)(5)

From: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>
Sent: Tuesday, October 1, 2019 11:45 AM
To: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Thank you Jess!

Just in case you haven't seen these papers/abstracts, I am forwarding what it seems the most relevant (please see attached).

(b)(5)

Thank you,
Natalia

From: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Sent: Tuesday, October 1, 2019 10:27 AM

To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>

Subject: RE: Hot Springs and Water management plans

Hi all — Before this call at 2 pm today, I thought I'd pass along this guidance from Japan that seems relevant:

(b)(3)

(b)(3)

-----Original Appointment-----

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)

Sent: Wednesday, September 18, 2019 5:05 PM

To: Smith, Jessica (CDC/DDID/NCIRD/DBD); Said, Maria; Kesteloot, Kurt; Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Edens, William (Chris) (CDC/DDID/NCIRD/DBD)

Cc: Cooley, Laura A. (CDC/DDID/NCIRD/DBD); James, Allison (CDC arkansas.gov); Lucas, Claressa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD)

Subject: Hot Springs and Water management plans

When: Tuesday, October 1, 2019 2:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).

Where: Skype Meeting

Thanks Maria and Kurt. Let's shoot for 10/1 at 2:00 pm ET, but we can move it if needed.

And please feel free to forward the invitation to Laura Miller or any other folks that you think may be interested in joining (same for the AR DOH side, Allison).

Best regards,

Jessica

Join Skype Meeting

Trouble Joining? [Try Skype Web App](#)

Join by phone

(404) 553-8912,, (b)(6) (Atlanta Dial-in Conference Region)

English (United States)

(855) 348-8390,, (b)(6) Atlanta Dial-in Conference Region)

English (United States)

[Find a local number](#)

Conference ID: (b)(6)

[Forgot your dial-in PIN?](#) | [Help](#)

From: Said, Maria <maria_said@nps.gov>

Sent: Wednesday, September 18, 2019 3:01 PM

To: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>

Subject: Re: [EXTERNAL] RE: Hot Springs and Water management plans

Hi Kurt,

I think the call will focus on water management plans -- if you think the park would be interested in being part of that discussion, I think it would be fine. We can add Laura Miller and whoever else might be interested in the calendar invite once we have a day/time.

Maria

On Wed, Sep 18, 2019 at 1:49 PM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:

I'm fairly open that week and look forward to talking more. Should we invite a couple people from the Park?

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
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Office Phone: 1-402-661-1718
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Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

On Wed, Sep 18, 2019 at 11:45 AM Said, Maria <maria_said@nps.gov> wrote:

Fantastic.

Tuesday 10/1 is wide open for me too.

The rest of that week I'll be at the IDSA conference and could step out if need be, but it would be less ideal.

Thank you!

Maria

On Wed, Sep 18, 2019 at 11:23 AM Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

Hi Maria,

We're happy to reconvene to discuss WMPs at Hot Springs. Starting tomorrow Troy is going to be traveling internationally, but he's back in the office on the 30th if we could shoot for a time that week? I'm also looping in Jasen and Claressa in case they can join too, since they bring the

ASHRAE perspective and Claressa may be able to speak to the ecology of *Legionella* in this setting.

Right now it looks like Tuesday, 10/1 is wide open for us. Thurs, 10/3 we're free at 3:00 pm and then Friday, 10/4 at 1:00 pm and 3:00 pm ET.

Also, I was hoping we would have heard back from colleagues in Japan by now about any public health recommendations they have for similar settings, but unfortunately we haven't. I do think by the week of the 30th I should be able to do a quick lit review about cases and clusters associated with hot springs and can share any pertinent findings during the call.

Thanks,
Jessica

—

Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NCIRD/DBD/Respiratory Diseases Branch
404.718.5205 lyd7@cdc.gov

From: Said, Maria <maria_said@nps.gov>
Sent: Wednesday, September 18, 2019 9:22 AM
To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Subject: Hot Springs and Water management plans

Hi Laura, Jessica, and Troy,

We (NPS and Arkansas) are trying to figure out the best path forward with the Hot Springs legionella cases. As you know, all the environmental testing has been negative. However, we have had a number of travel-related cases, and, based on Arkansas state data, it looks like there might be increased cases in the Hot Springs area generally compared to the rest of the state -- although these data are still being analyzed, and I would leave it to Arkansas to confirm this.

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Sent: 1 Oct 2019 16:49:11 +0000
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Smith, Jessica (CDC/DDID/NCIRD/DBD);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Lucas, Claressa (CDC/DDID/NCIRD/DBD)
Subject: RE: Hot Springs and Water management plans
Attachments: FrenchHotSprings2001.pdf

I think

(b)(3)

(b)(3)

From: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>
Sent: Tuesday, October 1, 2019 12:29 PM
To: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
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Super helpful.

(b)(3)

(b)(3)

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Are others interpreting this the same?

(b)(3)

(b)(5)

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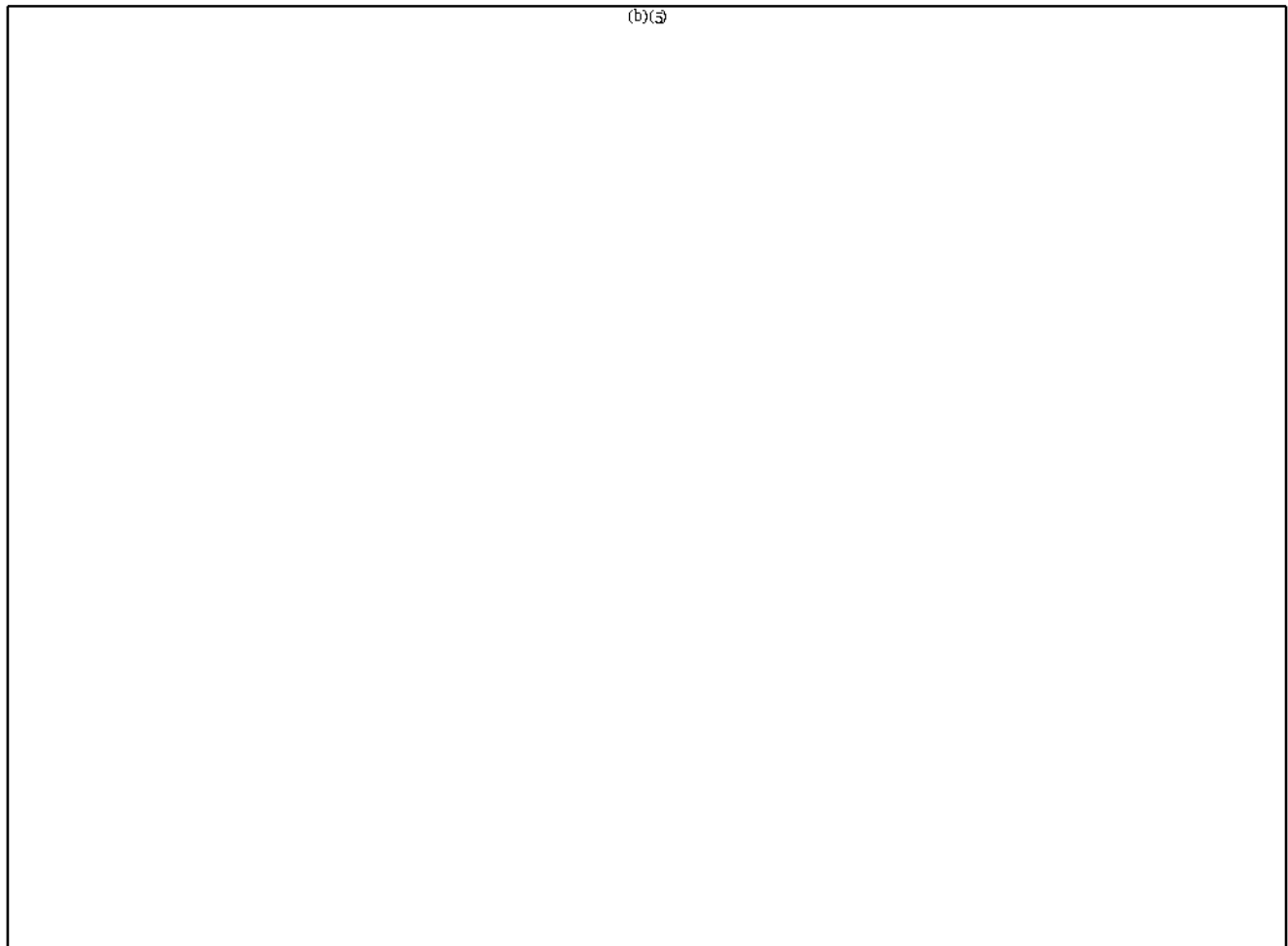
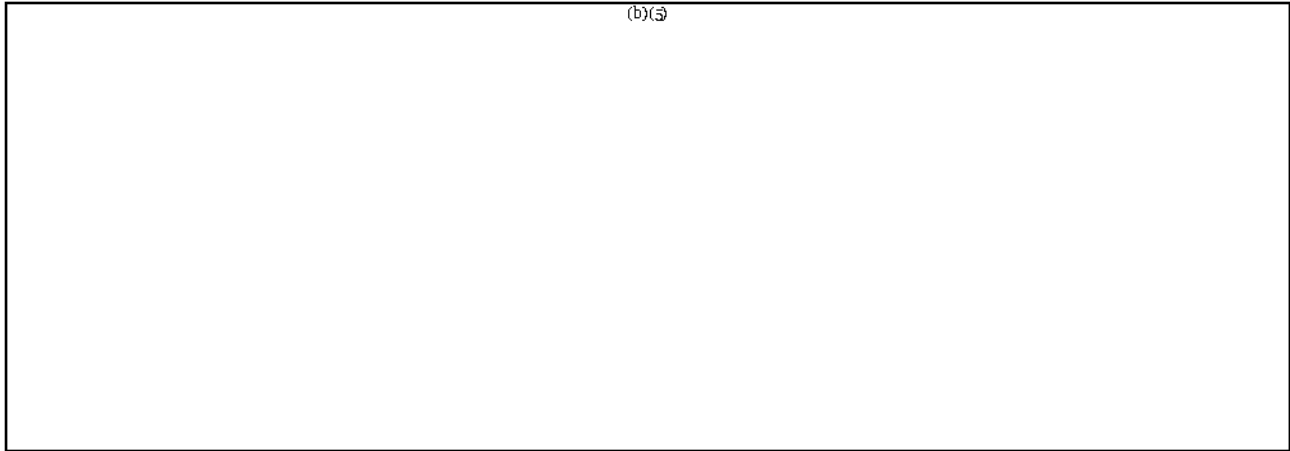
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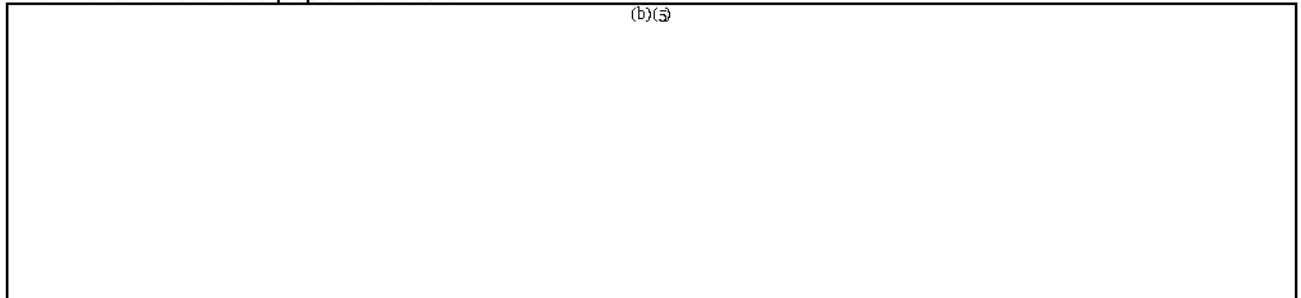
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Attachments: HotSprings2009Kurosawa.pdf, LargestHotSpringOutbreak2004.pdf, Legionella_RecWaters2018.pdf

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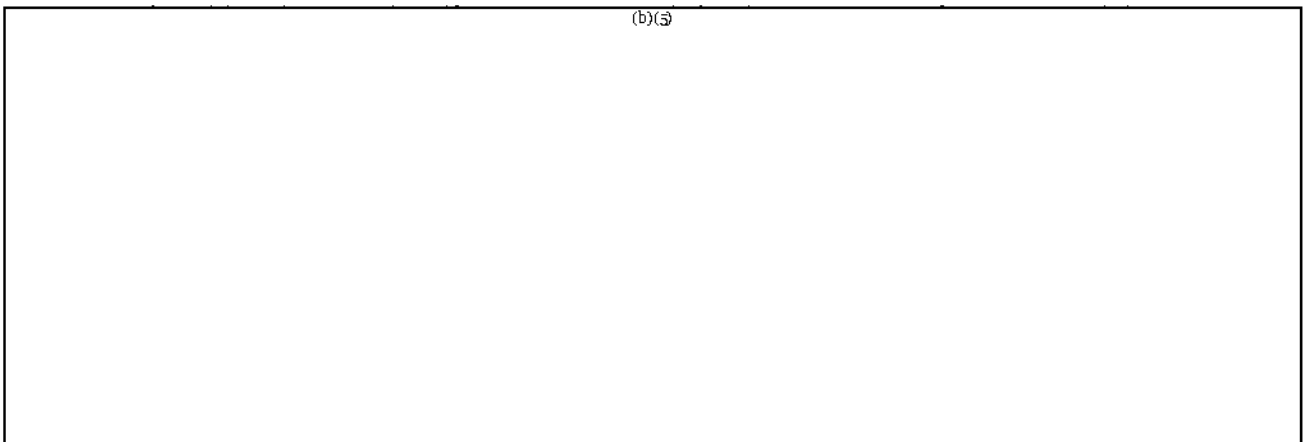
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Laboratory and Epidemiology Communications

A Case of *Legionella* Pneumonia Linked to a Hot Spring Facility in Gunma Prefecture, Japan

Hajime Kurosawa*, Masahiro Fujita, Satoshi Kobatake, Hirokazu Kimura¹, Mitsuko Ohshima², Akira Nagai², Shingaku Kaneko³, Yasuki Iwasaki¹, and Kunihisa Kozawa

Gunma Prefectural Institute of Public Health and Environmental Sciences, Gunma 371-0052; ¹Infectious Disease Surveillance Center, National Institute of Infectious Diseases, Tokyo 208-0011; ²Gunma Prefectural Government, Gunma 371-8570; and ³Maebashi Red Cross Hospital, Gunma 371-0014, Japan

Communicated by Masahiko Makino

(Accepted December 18, 2009)

Legionnaires' disease, which manifests as pneumonia or the less severe Pontiac fever, has been associated with hot spring facilities and public bath houses in Japan (1). Recent studies suggest the incidence of *Legionella* pneumonia in Japan is increasing (2). Here, we describe a case of *Legionella* pneumonia and identify the probable source of infection as the water from a hot spring facility in Maebashi-shi, Gunma Prefecture, Japan.

The case involves a 64-year-old Japanese male with diabetes mellitus. In February 2008, he often used the same hot spring facility near his home. On February 20, he developed symptoms including a low-grade fever (37.0°C) and a cough. He presented at Maebashi Red Cross Hospital with a high

fever (39.6°C) on February 26 (hospital day 1), with the following clinical data: leukocyte count, $11.3 \times 10^3/\mu\text{L}$ (normal range, $4.0\text{--}9.0 \times 10^3/\mu\text{L}$); platelet count, $1.36 \times 10^7/\mu\text{L}$ ($1.8\text{--}3.5 \times 10^7/\mu\text{L}$); and C-reactive protein level, 24.3 mg/dL (<0.5 mg/dL). Aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were 635 U/L (normal range, 13–33 U/L) and 150 U/L (8–42 U/L), respectively. Renal function was slightly deteriorated (blood urea nitrogen [BUN] value, 28 mg/dL; normal range, 0–20 mg/dL). In addition, chest radiography showed consolidation with an air bronchogram on the bilateral lung. Collectively, the clinical data suggested bacterial pneumonia, complicated by abnormal liver function and low-grade renal failure.

He was given the standard treatment for bacterial pneumonia, including the provision of oxygen (5 L/min) and the administration of the antibiotics ciprofloxacin (600 mg/day, days 1 to 24) and sulfamethoxazole/trimethoprim (800 mg/day, days 2 to 12). The lung lesion showed improvement from hospital day 4 onwards. Aspirated sputum samples were

*Corresponding author: Mailing address: Gunma Prefectural Institute of Public Health and Environmental Sciences, 378 Kamiokimachi, Maebashi-shi, Gunma 371-0052, Japan. Tel: +81-27-232-4881, Fax: +81-27-234-8438, E-mail: kurosawa-ha@pref.gunma.jp

collected and examined by bacterial culture using WYO α agar (Eiken Chemical Co., Ltd, Tokyo, Japan). *Legionella pneumophila* antigen was detected in a urine sample using an immunochromatographic assay (Duopath *Legionella*; Merck KGaA, Darmstadt, Germany) and the bacterium was isolated from the patient's sputum. A diagnosis of *Legionella* pneumonia was therefore confirmed.

Epidemiological data regarding the patient's visit to the hot spring and the subsequent detection and isolation of *L. pneumophila* led the patient's physician to suspect the site of the infection was contaminated water at the hot spring facility. The physician filed with Gunma Prefectural Maebashi Health Center a surveillance report of *L. pneumophila* infection possibly linked to a hot spring.

To confirm the source of *L. pneumophila*, we collected water samples from the relevant hot spring and examined the sample using GVPc agar (bioMérieux, Marcy l'Etoile, France). *L. pneumophila* was detected in the water sample. The isolates of *L. pneumophila* from the patient and hot spring water were identified as serogroup (SG) I. Using polymerase chain reaction (PCR), we genotyped these isolates as previously described (3,4). In addition, the PCR products, or amplicons, were examined by agarose gel electrophoresis and the isolates from the patient and hot spring water were genotyped as *L. pneumophila* (Fig. 1). We then performed pulsed-field gel electrophoresis (PFGE) with endonuclease *Sfi*I, as previously described (5). PFGE band patterns between isolates taken from the patient and the hot spring water were conclusively matched (Fig. 2), and the isolates were genotyped as *L. pneumophila* (SG1). On the basis of these data, the hot spring operators were deemed in violation of the Public Bath House Law (Issue 7, Item 1) and the Director of the Gunma Prefectural Maebashi Health Center ordered the bath house to close for 2 weeks.

L. pneumophila is the causative agent of *Legionella* pneumonia and Pontiac fever. This pathogen parasitizes amoeba

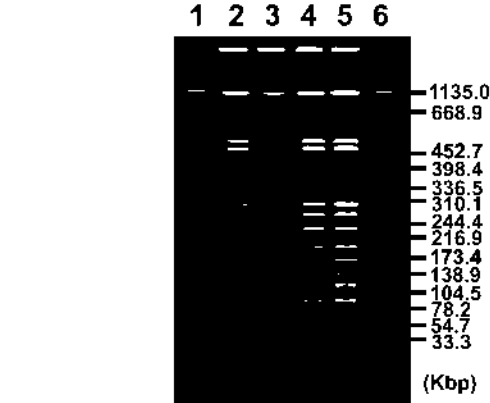


Fig. 2. Photographs of PFGE band patterns of isolates using an endonuclease *Sfi*I cleaved genomic DNAs. Lanes 1 and 6. Molecular size marker; Lanes 2 and 3. PFGE band patterns of isolates derived from hot spring water; Lanes 4 and 5. PFGE band patterns of isolates derived from the patient.

(*Acanthamoeba castellanii*), and it is thought that hot spring water and cooling-tower water provide favorable conditions for the propagation of the amoeba and the pathogen (6). *Legionella* pneumonia may, therefore, be caused by the inhalation of water aerosols contaminated with *L. pneumophila* (7). In Japan, the majority of *Legionella* pneumonia cases are caused by hot spring water contaminated with *L. pneumophila*. Consequently, most Japanese hot spring facilities are now equipped with an engineered closed-water circulation system. When the disinfection of the circulating hot spring water is inadequate, carrier amoebas and *L. pneumophila* may propagate and disseminate.

The case reported here should serve as an important reminder of the risk posed by public water systems as well as of the need for hot spring water facilities to disinfect against *L. pneumophila* and to operate closed water circulation systems to guard against this life-threatening pathogen.

This article appeared in the Infectious Agents Surveillance Report (IASR), vol. 29, 193–194, 2008 in Japanese.

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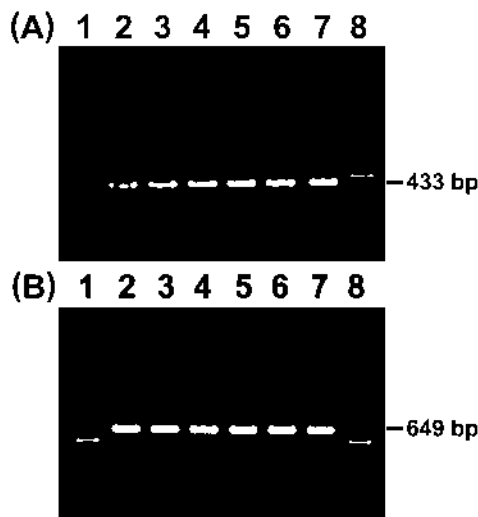


Fig. 1. Agarose gel electrophoresis of the PCR products. (A) Genus *Legionella* 16S rRNA gene 433 bp. (B) *L. pneumophila* macrophage infectivity potentiator gene 649 bp. Amplicons were electrophoresed on a 1.5% agarose gel. Lanes 1 and 8. Marker (100-bp DNA Ladder); Lanes 2, 3, and 4, amplicons derived from isolates of hot spring water; Lanes 5 and 6, amplicons derived from the patient; Lane 7, amplicons derived from ATCC 33152 strain used as a standard.

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Kansenshogaku Zasshi. 2004 Feb;78(2):90-8.

[An outbreak of legionellosis in a new facility of hot spring bath in Hiuga City].

[Article in Japanese]

Yabuuchi E¹, Agata K.

Author information

Abstract

Following celebrating ceremony in 20 June 2002, for the completion of Hiuga Sun-Park Hot Spring Bath "Ofunade-no-Yu" facilities, Miyazaki Prefecture, Kyushu Island, 200 neighbors were invited each day to experience bathing on 20 and 21 June. The Bath "Ofunade-no-Yu" officially opened on 1 July 2002. On 18 July, Hiuga Health Center was informed that 3 suspected *Legionella pneumonia* patients in a hospital and all of them have bathing history of "Ofunade-no-Yu". Health Center officers notified Hiuga City, the main proprietor of the Bath business, that on-site inspection on sanitary managements will be done next day and requested the City to keep the bath facilities as they are. On 19 July, Health Center officers collected bath water from seven places and recommended voluntary-closing of "Ofunade-no-Yu" business. Because of various reasons, Hiuga City did not accept the recommendation and continued business up to 23 July. Because *Legionella pneumophila* serogroup 1 strains from 4 patients' sputa and several bath water specimens were determined genetically similar by Pulsed Field Gel Electrophoresis of Sfi I-cut DNA, "Ofunade-no-Yu" was regarded as the source of infection of this outbreak. On 24 July, "Ofunade-no-Yu" accepted the Command to prohibit the business. Among 19,773 persons who took the bath during the period from 20 June to 23 July, 295 became ill, and 7 died. Among them, 34 were definitely diagnosed as *Legionella pneumonia* due to *L. pneumophila* SG 1, by either one or two tests of positive sputum culture, *Legionella*-specific urinary antigen, and significant rise of serum antibody titer against *L. pneumophila* SG 1. In addition to the 8 items shown by Miyazaki-Prefecture Investigation Committee as the cause of infection, Hiuga City Investigation Committee pointed out following 3 items: 1) Insufficient knowledge and understanding of stuffs on *Legionella* and legionellosis; 2) Residual water in tubing system after trial runs might lead multiplication of legionellae in it; and 3) Inadequate disinfection and washing for whole circulation system prior the experience bathing. The Hiuga City Committee directed 24 measures to improve the sanitary condition of the facility

including following 5 items. 1) Fix the manual for maintenance and management of the bath. 2) Keep sufficient overflow of bath water. 3) Put disinfection of filters into practice. 4) Precise measurement and control of the residual chlorine concentration in bath water. 5) Replacement of filtrating material from crushed porous ceramic into natural sand.

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Article

Legionellosis Associated with Recreational Waters: A Systematic Review of Cases and Outbreaks in Swimming Pools, Spa Pools, and Similar Environments

Erica Leoni ^{1,*}, Federica Catalani ², Sofia Marini ³ and Laura Dallolio ¹

¹ Unit of Hygiene, Public Health and Medical Statistics, Department of Biomedical and Neuromotor Sciences, University of Bologna, via S. Giacomo 12, 40126 Bologna, Italy; laura.dallolio@unibo.it

² School of Hygiene and Preventive Medicine, Department of Biomedical and Neuromotor Sciences, University of Bologna, via S. Giacomo 12, 40126 Bologna, Italy; federica.catalani@studio.unibo.it

³ Department of Life Quality Studies, University of Bologna, Campus of Rimini; Corso d'Augusto 237, 47921 Rimini, Italy; sofia.marini2@unibo.it

* Correspondence: erica.leoni@unibo.it; Tel.: +39-051-20948-07

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Abstract: *Legionella* spp. is widespread in many natural and artificial water systems, such as hot water distribution networks, cooling towers, and spas. A particular risk factor has been identified in the use of whirlpools and hot tubs in spa facilities and public baths. However, there has been no systematic synthesis of the published literature reporting legionellosis cases or outbreaks related to swimming/spa pools or similar environments used for recreational purposes (hot springs, hot tubs, whirlpools, natural spas). This study presents the results of a systematic review of the literature on cases and outbreaks associated with these environments. Data were extracted from 47 articles, including 42 events (17 sporadic cases and 25 outbreaks) and 1079 cases, 57.5% of which were diagnosed as Pontiac fever, without any deaths, and 42.5% were of Legionnaires' disease, with a fatality rate of 6.3%. The results are presented in relation to the distribution of *Legionella* species involved in the events, clinical manifestations and diagnosis, predisposing conditions in the patients, favourable environmental factors, and quality of the epidemiological investigation, as well as in relation to the different types of recreational water sources involved. Based on the epidemiological and microbiological criteria, the strength of evidence linking a case/outbreak of legionellosis with a recreational water system was classified as strong, probable, and possible; in more than half of the events the resulting association was strong.

Keywords: *Legionella* spp.; Legionnaires' disease; Pontiac fever; recreational water; hot tubs; whirlpools; spa pools; swimming pools

1. Introduction

Legionellosis is a disease transmitted through the inhalation of particles of aerosolized water contaminated by the opportunistic waterborne pathogen, *Legionella* spp. [1]. After the first recognition of legionellosis in 1976, when 221 participants of the annual convention of the American Legion contracted pneumonia and 34 of them died, surveillance systems were developed and implemented in several countries [2]. Legionellosis surveillance is a current public objective: In 2015, according to the European Centre for Disease Prevention and Control surveillance, 7034 cases were reported in Europe, concerning 1.4 cases per 100,000 inhabitants [3].

The majority of outbreaks described in the literature are correlated to *Legionella pneumophila*, in particular serogroup 1, but other serogroups and species were also associated to human disease, such as *L. micdadei* (now classified as *Tatlockia micdadei*), *L. dumoffii*, and *L. longbeachae* [4]. The two fundamental clinical pictures determined by these infective agents are Legionnaires' disease (LD) and Pontiac fever (PF): The former is generally characterized by an acute pneumonia and, rarely, by an extrapulmonary disease; Pontiac fever is a mild, self-limiting, flu-like illness, which resolves in a few days.

Legionella spp. are widely distributed in both natural (i.e., lakes, rivers, groundwater, thermal water) and man-made aquatic environments, such as the water systems of hospitals, hotels, private houses [5,6], cooling towers [7], dental units [8,9], and recreational [10,11] or therapeutic [12,13] facilities. Any system or equipment which contains, stores, or re-circulates non-sterile water that can be aerosolized is a source of legionellosis [14,15]. Considering these elements, the recreational use of water is an important potential way of exposure to *Legionella* spp., especially in hot water pools equipped with hydromassage systems. A recent review on outbreaks of LD and PF highlights that 14% of the reported outbreaks from 2006 to 2017 recognized pools or spas as an attributed or suspected source [16]. The role of these recreational facilities appears even more significant if one considers the growing popularity of private hot tubs and the increasing number of people frequenting public spa pools and similar environments.

Generally, the outbreak analysis and control measures, specific for each exposure setting, are essential tasks of Public Health Authorities, including outbreak surveillance and analysis specifically dedicated to the recreational water context. Epidemiological knowledge about these themes must be constantly updated. To our knowledge, no systematic synthesis or critical appraisal exists of the published literature reporting sporadic cases or outbreaks of LD and/or PF associated with recreational water. In the present study, we performed a systematic review and analysis of investigations on legionellosis cases or outbreaks related to treated and untreated recreational water, including natural waters, swimming pools, spa pools, and similar environments (hot tubs, whirlpools, hot spring baths, etc.), in accordance with the definitions given for these environments by World Health Organization (WHO) guidelines [17].

2. Materials and Methods

In line with the objective of the study, we set out to perform a systematic review of cases and outbreaks of LD and PF associated with recreational aquatic environments, such as swimming and spa pools or natural spas. The literature search was conducted in Medline, including publications from 1 January 1977 (since the disease was first described in 1976) to 31 May 2018, using the following search terms: (Legionella OR legionellosis OR "Pontiac fever" OR "Legionnaires' disease") AND (case* OR cluster* OR outbreak* OR infection* OR investigation OR surveillance) AND ("recreational water" OR spa OR pool OR "swimming pool" OR "hot tub" OR whirlpool OR bath OR "swim spa" OR "turkish bath" OR sauna OR Jacuzzi OR "natural spa" OR "hot spring" OR "thermal spring" OR "warm spring" OR spring OR thermal). The literature search was conducted without language restrictions, on the condition that the articles had an exhaustive abstract in English reporting the information of interest. A further selection of relevant publications was performed using the inclusion and exclusion criteria listed below.

Inclusion criteria:

- Primary studies describing cases/outbreaks of LD or PF originating from recreational water.

Exclusion criteria:

- Not recreational water (hot water system, cooling tower, fountain, network water, therapeutic water, water births);
- environmental studies without cases;
- not primary studies;

- articles focused only on clinical and laboratory aspects;
- abstract not available/ not complete or not exhaustive;
- articles focused on pools used for display only (retail premises, fairs, exhibitions, shows);
- articles evaluating only microbiological risk assessment; and
- hot tubs or pools on cruise ships (due to a recently published systematic review) [18].

Two researchers independently screened titles and abstracts to identify potentially relevant articles and to exclude articles incompatible with the first five exclusion criteria; any disagreements were resolved by discussion with a third author. After the application of the first five exclusion criteria, the full texts of the remaining articles were examined, and any publications exclusively focused on display spas were then excluded, since this type of exposure in environments used for retail premises, fairs, exhibitions, and shows is not directly linked to recreational use. The remaining articles were assigned to three categories related to three different recreational facilities or sources of infection:

- (a) Private hot tub and similar facilities;
- (b) public pools and spas and similar facilities, generally supplied by municipal network water; and
- (c) spa facilities supplied by natural water, or hot spring/thermal water. Subsequently, we applied the last two exclusion criteria to each category.

Data extracted from these publications included: Year, country, case definition, clinical form, type of event (sporadic case or outbreak), number of cases, attack rate, number of hospitalizations and/or deaths, risk factors, laboratory diagnosis, *Legionella* spp. involved, environmental isolates and concentrations (cfu/L), type of recreational water, water supply, and the type of epidemiological study carried out (descriptive, analytical, presence/absence of environmental investigation). An event with multiple cases (at least two) linked in space and time, with a suspected common source, was defined as an outbreak. For each event (both sporadic cases and outbreaks), epidemiological and microbiological criteria were adopted to characterize the strength of evidence linking the legionellosis event with the suspected recreational water system. Table 1 summarizes these criteria.

Table 1. Strength of evidence linking a case/outbreak of legionellosis with a recreational water system.

Strength of Evidence	Epidemiological and Microbiological Criteria
Strong	<ul style="list-style-type: none"> • An analytical epidemiological study demonstrates a significant association between case/outbreak of legionellosis and exposure to the recreational water; and • the same species and serogroups of <i>Legionella</i> spp. are isolated from the water system at any concentration. <p style="text-align: center;">Or</p> <ul style="list-style-type: none"> • Descriptive epidemiology suggests that the case/outbreak is related to the recreational water and excludes obvious alternative explanations; and • <i>Legionella</i> spp. are isolated from the water system at any concentration and environmental isolates show identical genotype profiles of clinical isolates.
Probable	<ul style="list-style-type: none"> • An analytical epidemiological study demonstrates a significant association between case/outbreak of legionellosis and exposure to the recreational water; and • <i>Legionella</i> spp. are not isolated from the recreational water. <p style="text-align: center;">Or</p> <ul style="list-style-type: none"> • Descriptive epidemiology suggests that the case/outbreak is related to the recreational water and excludes obvious alternative explanations; and • the same species and serogroups of <i>Legionella</i> spp. are isolated from the water system at any concentration.
Possible	<ul style="list-style-type: none"> • Descriptive epidemiology suggests that the case/outbreak is related to exposure to the recreational water and excludes obvious alternative explanations; and • <i>Legionella</i> spp. are not isolated from the recreational water.

Data were analysed as the frequency distribution of the different variables included.

3. Results

Of the 326 articles retrieved from Medline, 259 were excluded for the following reasons: 99 investigations did not refer to recreational water, 82 were environmental studies without cases, 4 were not primary studies, 68 articles were focused only on clinical and laboratory aspects, and 6 publications were in a language other than English and did not have an exhaustive English abstract, as shown in Figure 1.

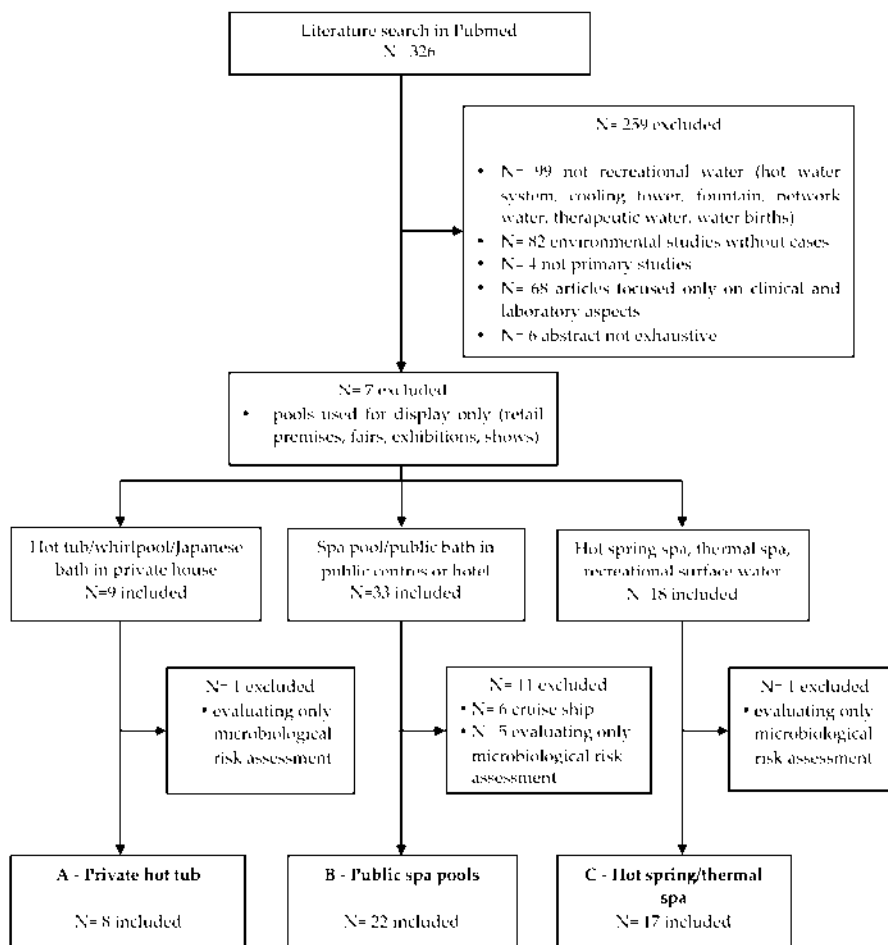


Figure 1. Flow chart of the selection process of articles.

At the end of the selection process, 47 articles were considered eligible for inclusion in the present review, corresponding to 42 events. In four cases, different articles described varying aspects of the same event, while two articles reported two and three different events, respectively. Among the 42 events of legionellosis, eight were linked to a hot tub/whirlpool/Japanese bath used in private houses (Category A in Figure 1, in brief “private hot tub”), 22 were related to whirlpool spa/baths in public centres and hotels (Category B in Figure 2, in brief “public spa pools”), and 12 to hot spring/thermal spa pools (Category C in Figure 1, in brief “hot spring/thermal spa”).

The selected articles were published: Four in the 1980s, 16 in the 1990s, 19 in the 2000s, and three from 2010 to 2018. In 11 articles, the authors did not report the date of onset. The events occurred in different countries across the world, with the highest frequency of hot spring related events in Japan (83.3%) and an overall highest frequency in Japan (18 events: 42.9%), followed by the USA (11 events: 26.2%), and the United Kingdom (4 events: 9.5%).

3.1. Legionellosis in Relation to Recreational Water Source

Table 2 shows all events and cases of legionellosis associated with recreational water systems, distinguished per facility category. Of the 1079 total cases included in the 42 events, 57.5% were diagnosed as PF, without any deaths, and 42.5% were of LD, with a fatality rate of 6.3%.

Table 2. Events of Pontiac fever (PF) and Legionnaires' disease (LD) associated with recreational water.

Characteristics of the Events	Hot Tub/Whirlpool/Japanese Bath in Private House (8 Events)	Spa Pools/Public Baths in Public Centres or Hotels (22 Events)	Hot Spring Spa, Thermal Spa, Recreational Surface Water (12 Events)	Total Recreational Waters (42 Events)
Number of events with single cases	5	2	10	17
Number of outbreaks or events with repeated cases ^a	3	20	2	25
Number of total cases	28	744	307	1079
Median number of cases per outbreak (range)	6 (4–13)	23.5 (3–170)	148.5 (2–295)	23 (2–295)
Total number of PF cases (fatal cases)	22 (0)	598 (0)	0	620 (0)
Total number of LD cases (fatal cases)	6 (1)	146 (16)	307 (12)	459 (29)
Fatality rate on total cases (on LD cases)	3.6% (16.7%)	2.2% (11.0%)	3.9% (3.9%)	2.7% (6.3%)
Analytical epidemiology in outbreak investigation (% of total outbreaks)	0 (0%)	8 (40.0%)	1 (50.0%)	9 (36.0%)
Events with environmental investigation (% of total events)	6 (75.0%)	20 (90.9%)	9 (75.0%)	35 (83.3%)
<i>Legionella</i> spp. detected in environmental water samples (% of total events)	4 (50.0%)	20 (90.9%)	8 (66.7%)	32 (76.2%)
Identical <i>Legionella</i> genotype in clinical and environmental isolates (% of total events)	1 (12.5%)	6 (27.3%)	7 (58.3%)	14 (33.3%)
Strength of evidence				
Strong (%)	1 (12.5%)	15 (68.2%)	7 (58.3%)	23 (52.4%)
Probable (%)	3 (37.5%)	5 (22.7%)	1 (8.3%)	9 (21.4%)
Possible (%)	4 (50.0%)	2 (9.1%)	4 (33.3%)	10 (23.9%)

^a 22 outbreaks and three events with repeated cases or cluster.

The private hot tubs were all supplied by municipal network water and were subjected to a supplementary disinfection system only in two of the eight facilities involved in the legionellosis events. Single cases occurred in five events (62.5%) corresponding to 17.9% of cases, while the remaining three events were outbreaks with a low number of persons involved (from four to 13). LD represented 21.4% of the cases, with a fatality rate of 16.7%.

Public spa pools were generally supplied by municipal network water and only three out of 22 facilities had their own supply system from groundwater (two spa pools) and mountain spring water (one spa pool). In 54.5% of the facilities, water treatment included recycling, filtering, and chemical disinfection with bromine (seven spa pools) or chlorine (five spa pools). In the remaining public spa pools, water disinfection was not mentioned. Public spa pools were responsible for the highest number of events (22), cases (744), and deaths (16). A sporadic case only occurred in 9.1% of the events, while the remaining events were outbreaks often involving a high number of cases of up to 170 [19]. The LD cases formed 19.6% of the total cases, with a fatality rate of 11.0%.

Hot spring/thermal spas were supplied by natural waters, i.e., hot springs and thermal waters. This group also includes the only LD case associated with bathing in surface water. This was a fatal case in a 27-year-old woman who had nearly drowned in estuarine water [20]. Water treatment and chlorine disinfection were reported in only three out of the 11 hot spring/thermal water facilities (27.3%), while, in one case, the authors specified that national regulations (France) precluded the addition of chemicals to thermal spas to preserve the characteristics of the mineral water [21]. All cases linked to this recreational water category were diagnosed as LD, with a fatality rate of 3.9%. Single cases occurred in 83.3% of the events and only two outbreaks were reported. However, one of these was the largest outbreak of LD associated with a hot spring bathhouse in Japan, with 295 cases, including confirmed and probable cases [22].

3.2. Epidemiological Investigations

All the events with sporadic cases were studied by descriptive epidemiology. The epidemiological investigations included an analytical study in 36.0% of outbreaks, with higher percentages in events linked to public spa pools (40.0%) and hot spring/thermal water (50%), compared to private hot tubs (no events with an analytical study). An environmental investigation was carried out in 83.3% of events (private hot tubs and hot spring/thermal water: 75%; public spa pools: 90.9%) and allowed the detection of *Legionella* spp. in 76.2% of the incriminated water sources and to evidence identical molecular profiles of both clinical and environmental isolates in 33.3% of the events. Based on the epidemiological and microbiological criteria specified in Table 1, the strength of evidence linking the case/outbreak of legionellosis with the recreational water system was strong in 23 events (52.4%), with percentages higher for public spa pools (68.2%) and hot spring/thermal water (58.3%) compared to private hot tubs (12.5%). This was a consequence of the previously mentioned differences regarding both the implementation of analytic epidemiology and the detection of environmental *Legionella* spp., which were carried out less frequently in private hot tub related events.

3.3. Events with Sporadic Cases of Legionellosis

Sporadic cases of legionellosis occurred in 17 distinct events, only one of PF [23] and 16 of LD (Table 3), with a fatality rate of 29.4% (31.2% for LD cases). Most cases occurred in Japan (70.6%) [24–35], and hot spring/thermal waters (56.2%) were the facilities most involved, followed by private hot tubs (25%). Only two cases occurred in spa centres/public baths [35,36]. Four cases, three of which fatal, were consequent to near drowning [20,32,35,37] and one case involved a 10-year-old girl, subjected to immunosuppressive therapy for hemosiderosis after being exposed several times to the hot tub in her maternal home [38].

Etiological diagnosis was confirmed by culture of clinical specimens in 75.0% of LD cases and *L. pneumophila* was the species most frequently involved, in particular *L. pneumophila* SG 6 (31.2% of LD cases). No differences were observed on the onset of cases in relation to the different concentrations of legionellae detected from the suspected water sources. Genotyping of clinical and environmental isolates was performed in seven out of 17 events. In accordance with the microbiological criteria specified in Table 1, the strength of evidence linking the cases with the recreational water system was strong in all the cases confirmed by molecular typing (43.7% of LD cases).

Table 3. Events with sporadic cases of Pontiac fever (PF) and Legionnaires' disease (LD) associated with recreational water.

	Pontiac Fever (1 Event) ^a	Legionnaires' Disease (16 Events) ^b
Number of cases (fatal cases)	1 (0)	16 (5)
Gender		
Males		9
Females		6
Not reported	1	1
Median age (range)	37	56.5 (10–88)
Confirmation by culture in clinical specimen	0	12 (75.0%)
<i>Legionella</i> species and serogroup		
<i>L. pneumophila</i> SG 1	0	3 (18.7%)
<i>L. pneumophila</i> SG 2	0	1 (6.2%)
<i>L. pneumophila</i> SG 3	0	2 (12.5%)
<i>L. pneumophila</i> SG 4	0	1 (6.2%)
<i>L. pneumophila</i> SG 6	0	5 (31.2%)
<i>L. pneumophila</i> SG 13	0	2 (12.5%)
<i>L. pneumophila</i> (SG not reported)	1 (100%)	1 (6.2%)
<i>L. rubrilucens</i>	0	1 (6.2%)

Table 3. Cont.

	Pontiac Fever (1 Event) ^a	Legionnaires' Disease (16 Events) ^b
Environmental source		
Private hot tub	1	4 (25.0%)
Public and hotel spa	0	2 (12.5%)
Hot spring/thermal spa	0	9 (56.2%)
Estuarine water	0	1 (6.2%)
Legionella colonization		
<1000 cfu/L	0	2 (12.5%)
1000–10,000 cfu/L	0	2 (12.5%)
>10,000 cfu/L	0	2 (12.5%)
Not reported	1 (100%)	11 (68.7%)
Identical <i>Legionella</i> genotype in clinical and environmental isolates	0	7 (43.7%)
Strength of evidence		
Strong (%)	0	7 (43.7%)
Probable (%)	1 (100%)	2 (12.5%)
Possible (%)	0	7 (43.7%)

^a [23]; ^b [20,24–38].

3.4. Outbreaks of Legionellosis

A total of 25 outbreaks of legionellosis were found: 7 outbreaks of PF (Table 4), 11 outbreaks of LD (Table 5), and 7 mixed events of PF and LD (Table 6). Among the LD events, two were repeated cases on the same site, which occurred in different time periods (No. 2, 3 in Table 6), and one was a long-lasting outbreak with three consecutive clusters (No. 10 in Table 6).

The total number of outbreak cases was 1062, of which 619 were PF cases (58.3%) and 443 were LD cases (41.7%), with 24 deaths (total fatality rate: 2.3%, for LD: 5.4%). Most events occurred in public spas (20/25 outbreaks, 80%), particularly in whirlpool spas of hotels or similar residential facilities, such as inns and holiday resorts (11 of 25 outbreaks, 44%). The attack rate varied from 29.8% to 86.7% for PF outbreaks and from 0.13% to 1.9% for LD outbreaks.

Etiological diagnosis was confirmed by culture of clinical specimens in 10 out of 11 outbreaks of LD and in one out of seven mixed events of PF and LD (61.1% of total events with LD cases), while it was never performed in PF outbreaks. *L. pneumophila* was the species most frequently involved, in particular *L. pneumophila* SG 1 in 68% of total outbreaks (83.3% of outbreaks with LD cases) and SG 6 in 24% of total outbreaks (27.8% of outbreaks with LD cases). In three events, various species or serogroups were identified as responsible for the disease by culture and/or serological assay.

Environmental isolates of *Legionella* spp. were obtained in 22 outbreaks (88%), in seven of which various species or serogroups were detected (28%). Genotyping of clinical and environmental isolates was performed in 10 events (40% of total outbreaks, 55.5% of outbreaks with LD cases). In accordance with the epidemiological and microbiological criteria specified in Table 1, the strength of evidence linking the outbreak with the recreational water system was strong in 16 events (64%).

Table 4. Outbreaks of Pontiac fever (PF) associated with recreational water.

Event No. Country, Year (Reference)	Water System	<i>Legionella</i> spp. (Confirmed Diagnosis Based on)	No. of Cases (Fatal Cases)	Attack Rate	Proportion of Males	Median Age (Range)	Environmental Isolates (cfu/L)	Strength of Evidence
1 Vermont, US, 1981 [39]	Inn whirlpool spa	<i>L. pneumophila</i> SG 6 (antibody titre)	34 (0)	45.9%	53.0%	27.9	<i>L. pneumophila</i> SG 1,6 <i>L. dumoffii</i>	Strong
2 Michigan, US, 1982 [40]	Public whirlpool spa (women's pool)	<i>L. pneumophila</i> SG 6 (antibody titre)	14 (0)	29.8%	0	32 (25–39)	<i>L. pneumophila</i> SG 6	Strong
3 Colorado, US, 1992 [41]	Resort indoor whirlpool	<i>L. pneumophila</i> SG 6 (antibody titre)	13 (0)	38.0%	na	na	<i>L. pneumophila</i> SG 6 (>1,000,000)	Strong
4 Denmark, 1995 [42]	Private summerhouse whirlpool	<i>L. pneumophila</i> SG 1 (culture, antibody titre) <i>L. micdadei</i> (antibody titre)	13 (0)	86.7%	na	na	negative samples (after whirlpool cleaning)	Possible
5 Wisconsin, US, 1998 [43]	Hotel whirlpool spa	<i>L. micdadei</i> (antibody titre)	45 (0)	whirlpool area: 66.0% whirlpool users: 71.0%	na	na	<i>L. micdadei</i> (90,000/L)	Strong
6 Sweden, 1999 [44]	Hotel whirlpool spa	<i>L. micdadei</i> (antibody titre)	29 (0)	whirlpool area: 71.0% whirlpool users: 88.9%	37.9%	41 (21–57)	negative samples	Probable
7 England, 2008 [45]	Resort whirlpool spa	<i>L. pneumophila</i> SG 1 (antibody titre, urinary antigen)	6 (0)	86.0%	0	(24–37)	<i>Legionella</i> non <i>pneumophila</i> (100/L)	Probable

na: Not available; clinical and environmental isolates were never compared by molecular typing.

Table 5. Outbreaks of Legionnaires' disease (LD) associated with recreational water.

Event No. Country, Year (Reference)	Water System	<i>Legionella</i> spp. (Diagnosis Based on)	Number of Cases (Fatal Cases)	Attack Rate	Proportion of Males	Median Age (Range)	Environmental Isolates (cfu/L)	Strength of Evidence
1 Vermont, US, 1987 [28]	Inn whirlpool spa	<i>L. pneumophila</i> SG 1 (culture, antibody titre)	3 (0)	na	na	na	<i>L. pneumophila</i> SG 1,4	Strong
2 Netherlands 1992–96 [17]	Public spa sauna's footbath	<i>L. pneumophila</i> SG 1 (culture)	6 repeated cases (2)	na	83.3%	males: 50 females: 28	<i>L. pneumophila</i> SG 1	Strong
3 France: 1994–97 [21]	Thermal spa	<i>L. pneumophila</i> SG 1 (culture)	2 repeated cases (1)	na	50%	54.5 (40–69)	<i>L. pneumophila</i> SG 1,2,3,6,9,13 <i>L. dumoffii</i>	Strong
4 Japan, 1996 [28]	Public Japanese spa	<i>L. pneumophila</i> SG 1 (antibody titre)	3 (0)	na	na	na	<i>L. pneumophila</i> SG 1	Probable
5 Japan, 2000 [27]	Public bath house	<i>L. pneumophila</i> SG 1,6 (culture, antibody titre, urinary antigen)	23 (2)	0.13%	91.3%	67 (50–86)	<i>L. pneumophila</i> SG 1 (880,000)	Strong
6 Japan, 2000 [29,31]	Public bath house	<i>L. pneumophila</i> SG 1 (culture, antibody titre, urinary antigen)	34 (20 confirmed) (3)	0.20%	65.0% (only confirmed)	62.2 (27–85)	<i>L. pneumophila</i> SG 1,3,5,6 (11400–84200)	Strong
7 Japan, 2002 [23,31–35]	Hot spring bath	<i>L. pneumophila</i> SG 1 (culture, antibody titre, urinary antigen)	295 including suspected cases (7)	1.5%	64.5% (of 76 examined)	65 (9–95)	<i>L. pneumophila</i> SG 1,8 (1,600,000) <i>L. dumoffii</i> (5,200,000) <i>L. londiniensis</i> (15,000,000)	Strong
8 Japan, 2003 [27]	Public bath house	<i>L. pneumophila</i> SG 1 (culture)	9 (1)	0.13%	na	65 (52–82)	<i>L. pneumophila</i> SG 1 (1,300,000)	Probable
9 France, 2010 [36]	Public whirlpool spa	<i>L. pneumophila</i> SG 1 (culture, urinary antigen)	3 (1)	na	33.3%	50 (30–70)	<i>L. pneumophila</i> SG 1 (150,000)	Strong
10 Spain, 2011–12 [37]	Hotel spa pool	<i>L. pneumophila</i> SG 1 (culture)	Total: 44 (6) Cluster1: 21 Cluster2: 2 Cluster3: 3 Cluster4: 18	na	na	tourists: 71.5 hotel workers: 49.5	<i>L. pneumophila</i> SG 1 <i>L. micdadei</i>	Strong
11 Japan, 2015 [38]	Spa house (men's pool)	<i>L. pneumophila</i> SG 1,13 (culture)	7 (0)	na	100%	66.3	<i>L. pneumophila</i> SG 1,13	Strong

na: Not available; clinical and environmental isolates showed correlated molecular profiles in events No. 1, 2, 3, 5, 6, 7, 9, 10, and 11.

Table 6. Outbreaks of Pontiac fever (PF)/Legionnaires' disease (LD) associated with recreational water.

Event No. Country, Year (Reference)	Water System	<i>Legionella</i> spp. (Diagnosis Based on)	Number of Cases PF + LD (Fatal Cases)	Attack Rate	Proportion of Males	Median Age (Range)	Environmental Isolates (cfu/L)	Strength of Evidence
1 Scotland, 1987–88 [19,59]	Hotel whirlpool spa	<i>L. micdadei</i> (antibody titre)	169 + 1 (0)	90.9% (LD: 0.5%)	48.8%	32 (2–72)	<i>L. micdadei</i>	Probable
2 Vermont US, 1991 [60]	Private hot tub in holiday home	<i>L. pneumophila</i> SG 1 (antibody titre)	5 + 1 (0)	na	na	na	not investigated	Possible
3 Georgia US, 1999 [61]	Hotel whirlpool spa	<i>L. pneumophila</i> SG 6 (culture, antibody titre, urinary antigen)	22 + 2 (0)	22.0% (LD: 1.8%)	na	PF: 12 (5–31) LD: 66 (61–71)	<i>L. pneumophila</i> SG 6	Strong
4 Illinois US, 2002 [62]	Hotel spa area	<i>L. micdadei</i> <i>L. maceachernii</i> (antibody titre)	49 + 1 (0)	62.7% (LD: 1.2%)	46%	20 (2–58)	<i>L. micdadei</i> <i>L. maceachernii</i> <i>L. dumoffii</i>	Strong
5 Oklahoma US, 2004 [63]	Hotel pool and hot tub area	<i>L. pneumophila</i> SG 1 (antibody titre, urinary antigen)	101 + 6 (0)	33.7% (LD: 1.9%)	PF: 43.6% LD: 100%	PF: 15 (2–65) LD: 6.5 (2–44)	<i>L. pneumophila</i> SG 1	Strong
6 England, 2006 [64]	Leisure club spa pool	<i>L. pneumophila</i> SG 1 (antibody titre, urinary antigen)	116 + 2 (0)	na	PF: 41.4% LD: 100%	(18–85)	<i>L. pneumophila</i> SG 1	Probable
7 Netherlands, 2009 [65]	Private outdoor whirlpool spa	<i>L. pneumophila</i> SG 1 (antibody titre, urinary antigen)	3 + 1 (1 LD)	na	PF: 66.7% LD: 0%	PF: 54 (52–83) LD: 78	<i>L. pneumophila</i> SG 1	Probable

na: Not available; clinical and environmental isolates showed correlated molecular profiles in the event No. 3.

3.5. Patient Contributing Factors

PF cases showed no evidence of underlying risk factors. The median age of the PF patients, when reported, varied from 12 to 54 years and, overall, males and females were affected with a similar frequency.

LD patients were males in 60% of sporadic cases (Table 3) and in 71.9% of outbreaks, considering only the events reporting gender distribution. The median age was 56.5 years (range: 10–88) in sporadic cases and over 60 years in nine of the 13 LD outbreaks in which the age data was reported. Patient risk factors and underlying medical conditions were specified in 24 of the 34 LD events (71.3%), for a total of 155 cases. Figure 2 shows the occurrence of contributing factors and underlying medical conditions in these patients. Heavy smoking was the most frequent risk factor (58.7% of patients) and, among the underlying medical conditions, cardiovascular diseases (23.9%) and diabetes (11.0%) had the highest prevalence. Four cases of *Legionella* pneumonia occurred after near drowning, one in estuarine water and three in hot spring spas and public baths.

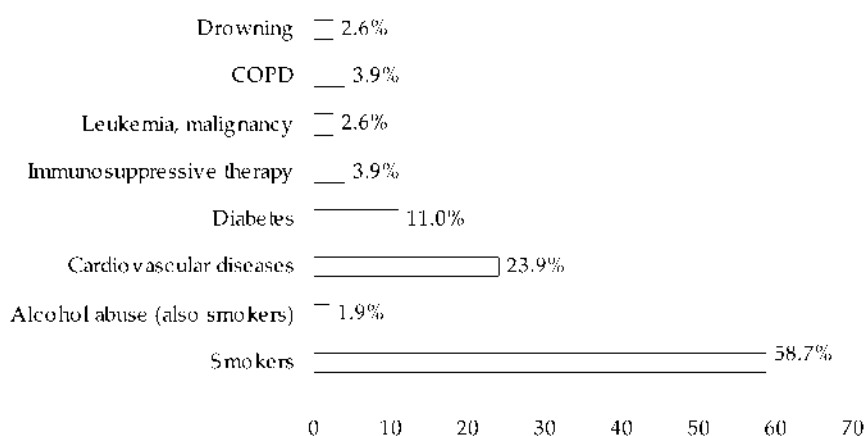


Figure 2. Distribution of underlying medical conditions and risk factors in 155 cases of Legionnaires' disease.

3.6. Environmental Contributing Factors

Excluding the only sporadic case related to estuarine water, environmental contributing factors were investigated in 22 out of 41 events. In only one of these, no contributing environmental conditions were found. In the other 21 events, inadequate water treatment and residual disinfectant below the recommended levels were the most frequent factors that could have favoured the onset of cases or outbreaks. The water temperature was reported in only four events and in three of these the temperature was above 40 °C (Figure 3). In PF events, the most frequent environmental contributing factors were those related to plant maintenance and chemical treatment management (i.e., inappropriate residual disinfectant concentration), while the inadequacy or absence of the treatment system was observed only for LD cases or outbreaks. This could be explained by the fact that many LD events occurred in private hot tubs not subjected to a supplementary disinfection system.

Legionella spp. were isolated from the environmental samples of 32 facilities, at concentrations higher than 10^3 cfu/L in water samples obtained from 11 of them (34.4%).

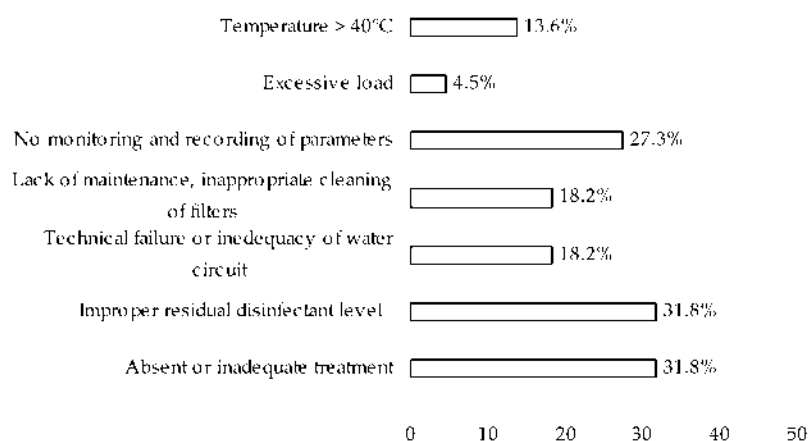


Figure 3. Distribution of environmental contributing factors in 22 recreational facilities associated with legionellosis events.

4. Discussion

This review aimed to evaluate the cases and outbreaks of legionellosis associated with exposure to recreational water since the disease was first described in 1976. Both sporadic cases and outbreaks of LD and PF, described in the scientific literature, were included. Relevant findings from 47 articles were synthesized, including 42 legionellosis events (17 sporadic cases and 25 outbreaks).

4.1. Temporal and Geographical Distribution

The events of legionellosis correlated with exposure to recreational water showed a non-homogeneous distribution over time. In the 1980s, only four events were reported, probably because, in these first years, there was a lower awareness of the problem and many cases were not identified or associated with exposure to recreational water. In the 1990s and 2000s, the number increased (16 and 19 events, respectively) and then declined in the years from 2010 until today (only three reported in the literature). It could be hypothesized that the increase in knowledge and awareness of risks associated with recreational water led to an improvement in the management and maintenance and control measures, also after the issuing of international guidelines on the control of legionellosis in recreational facilities. In 2006, the WHO Guidelines for safe recreational water environments recommended the implementation of safety plans and adequate control measures in pools and hot tubs [17]. Moreover, from 2005, the European Legionnaires' Disease Surveillance Network (ELDSNet, previously EWGLI), with respect to *Legionella* risk reduction in whirlpool spas, recommended continuous treatment with 2–3 mg/L of chlorine or bromine, the checking of these levels almost three times a day, the replacement of at least half of the water each day, sand filters backwashed daily, and cleaning and disinfection of the whole system every day [66]. The implementation of these measures could explain the reduction in the number of events in the most recent period.

The reported events of legionellosis involved 10 countries, with the highest number of events (18) and cases (385) in Japan, where the habit of frequenting hot spring spas and public baths is very widespread, following a long-established tradition in Japanese culture. Moreover, the average water temperature in hot tubs in Japan usually ranges from 40 °C to 43 °C, which is higher than in Europe (30–40 °C) [27].

4.2. Clinical Features and Laboratory Evidence

This review includes both PF and LD events. PF cases totalled 620, only one of which was sporadic, the others being included in 14 outbreaks. The number of PF cases related to recreational water is probably underestimated: The benign nature of the disease, which often presents as an influenza-like

illness, means that the cases, especially when sporadic, are not identified as legionellosis and are, therefore, not subjected to laboratory diagnosis. In the selected PF events, laboratory diagnosis was performed only in outbreaks, and *Legionella* spp. were never culturally isolated. On the contrary, in the events involving LD cases, cultural isolation from patients' specimens allowed the species to be identified in 75% of the sporadic cases and in 11 of the 18 outbreaks with LD cases (61.1%).

Among the different species and serogroups, *L. pneumophila* SG 1 (three sporadic cases and 15 outbreaks of LD) and SG 6 (five sporadic cases and two outbreaks of LD) were the agents most frequently responsible, while, among the other species, *L. micdadei* was implicated in three outbreaks of PF and two outbreaks of mixed PF and LD. In five events, various species or serogroups were involved [27,30,42,58,62], one of which was the first case where the same genotype of *L. rubrilucens* was isolated from the LD patient's sputum and the hot spring water [30].

This review confirms certain known characteristics of the epidemiology of legionellosis. PF cases showed no evidence of underlying risk factors and PF outbreaks had a high attack rate, with no difference between males and females. On the contrary, LD cases prevalently involved males and individuals presenting risk factors, such as smoking and all the underlying medical conditions that reduce immune defenses. In LD outbreaks, the attack rate is low and the fatality rate is high (on average, 6.3%, but up to 31.2% in events related to private hot tubs).

4.3. Recreational Water Facilities and Risk Assessment

Most events occurred in public spa pools (22 events, 744 cases). Of these, 10 were associated with hotels or similar residential facilities and, therefore, fall within the surveillance system for legionellosis linked to travel, which in Europe is carried out by the ELDSNet and coordinated by ECDC. The recreational facilities supplied by natural water (hot spring, thermal water) were the setting for 12 events, 10 of which with a single case. Most studies referring to hot spring/thermal spas (seven out of 11) did not specify if the water was treated or untreated and how the facility was managed; this is a limitation that makes it difficult to draw conclusions about the environmental conditions contributing to these infections.

The recommended standards for *Legionella* spp. in hot tub water range from 0/100 mL to 1000/L in different countries [67]. In the selected studies, the environmental isolates of *Legionella* spp. are reported in 32 events, but only 13 specify the level of contamination, which ranges between 100 cfu/L and $>10^6$ cfu/L. However, it should be noted that the isolation of *Legionella* spp. from environmental samples was carried out after the legionellosis event had occurred and so the environmental conditions may have changed. The lack of data on the *Legionella* concentrations in the water, and on the frequency and duration of exposure, makes it difficult to perform a risk assessment. Various studies tried to estimate the risk for *Legionella* infection due to spa pool use. Bouwknegt et al., (2013) estimated that the infection risk for sitting in an active whirlpool for 15 min ranged from around 3% for a concentration of 10 *L. pneumophila* cfu/L to up to 95% for >1000 cfu/L [68]. These findings suggest that a risk cannot be excluded even in the presence of very low concentrations, and stricter requirements may be needed to ensure adequate protection for users. Azima et al. (2013) suggested a reference value of <1 cfu/L, which is less than the current detection limit [69].

4.4. Epidemiological Investigation and Strength of Evidence

The epidemiological investigation included an analytical study in nine outbreaks, four with a case-control study and five with a retrospective cohort study. In all the events related to private hot tubs, only descriptive epidemiology was carried out. This is justified by the difficulty in such events to find a control group not exposed to the private hot tub. Also, sporadic cases were studied only through descriptive epidemiology (case reports).

The environmental investigation was often delayed with respect to the event onset and, in some cases, was made after control measures had already been adopted. These measures are specified only in a limited number of articles and information is lacking on the follow-up procedures in almost

all the articles. Many studies do not report the environmental conditions that could have favoured such infections. In 19 events, no information is available on the type of water treatment, the level of residual disinfectant, or the state of maintenance of the facility. Only in three events is the water temperature specified, a factor that, in these types of recreational facilities, plays a fundamental role in the development of *Legionella* spp. and was probably co-responsible for three LD cases associated with near drowning in hot spring spas and public baths [32,35,37]. Lying in or sitting up to the neck in hot water (above 40 °C), especially in combination with alcohol consumption, may cause drowsiness, which may then lead to unconsciousness and, consequently, drowning [70].

Based on the selected criteria, the strength of evidence linking the cases/outbreaks to the recreational water facilities was strong in 52.4% of events, probable in 21.4%, and possible in 23.9%. Strong evidence was principally attributable to the results of analytical study in nine events, and to the match of environmental and clinical isolates in 17 events. The comparison between strains of environmental and clinical origin using molecular biology techniques was carried out at a very high level of frequency, especially in cases concerning LD (43.7% of sporadic cases and 81.8% of LD outbreaks).

4.5. Limitations

The present study was limited to articles published in English or with an exhaustive abstract in English, and only peer-reviewed literature was considered. Furthermore, the legionellosis events that are published represent only part of the overall number of cases: Larger LD outbreaks are more likely to be published than sporadic cases and smaller events, especially of Pontiac fever. Also, the review does not include cruise ship cases [18] and cases associated with display spa pools in retail premises, fairs, exhibitions, and shows [71,72], which represent another important source of infection. Therefore, the role of the recreational facilities as a source of infection is underestimated, also considering that in many LD and PF cases the source of *Legionella* remains unknown [3,16].

The heterogeneity of epidemiological investigations, in terms of study design, sample size, and information about the duration of exposure and environmental contributing factors, limited the comparison of results. In particular, the lack of information about the treatment and management of recreational facilities makes it difficult to exhaustively evaluate the role of environmental conditions.

5. Conclusions

Data extracted from the articles in this systematic review show that hot tubs, whirlpools, and spa pools represent an important source of infection of *Legionella* spp., given the number of cases involved (1079 from 1981 to 2015), the number of deaths (29), and the high percentage of events with strong evidence of an association. On the contrary, the risk related to the natural recreational water of rivers and lakes appears negligible: The only sporadic case reported is a case consequent to a near-drowning in estuarine water [20].

Among the cases included in this review, PF cases were the most numerous and were caused by a variety of species and serogroups: *L. pneumophila* SG 6 and *L. micdadei* were the most often responsible agents, while *L. pneumophila* SG 1 was responsible for most LD cases. Unlike PF cases, LD cases prevalently involved individuals presenting risk factors, such as smoking, and underlying medical conditions that reduce immune defenses.

Certain operating conditions that facilitate the formation of aerosol, such as the high temperature of the water and the presence of hydromassage systems, are risk factors inherent to this kind of recreational water. In hot tubs and similar facilities, it is impractical to maintain a water temperature outside the range considered at risk. Therefore, other management strategies need to be implemented, which may include appropriate design and adequate disinfection residual and proper maintenance and cleaning of equipment as well as adequate ventilation. Features, such as water sprays, should be periodically cleaned and flushed with a level of disinfectant adequate to eliminate *Legionella* spp. [3,17,67]. In this review, the environmental conditions were described for

22 events, and in 21 of these (95.5%) at least one of the preventive measures recommended by the various guidelines was not respected. Therefore, it seems important to increase collaboration between the different professionals involved (public health experts, policy makers, facility managers, technical staff, equipment manufacturers) to improve the knowledge of the operators and their awareness of the risk and to favour compliance with control measures.

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Abbreviations

The following abbreviations are used in this manuscript:

LD	Legionnaires' Disease
PF	Pontiac Fever
cfu	colony forming unit

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From: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Sent: 1 Oct 2019 14:26:55 +0000
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Lucas, Claressa (CDC/DDID/NCIRD/DBD); Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD)
Subject: RE: Hot Springs and Water management plans

Hi all — Before this call at 2 pm today, I thought I'd pass along this guidance from Japan that seems relevant:

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and ammonia each solution of A must be mixed with tap water and generated on-site. Acid hot spring quality cannot be used because of bad odor substances such as trichloramine.

-----Original Appointment-----

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)

Sent: Wednesday, September 18, 2019 5:05 PM

To: Smith, Jessica (CDC/DDID/NCIRD/DBD); Said, Maria; Kesteloot, Kurt; Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Edens, William (Chris) (CDC/DDID/NCIRD/DBD)

Cc: Cooley, Laura A. (CDC/DDID/NCIRD/DBD); James, Allison (CDC arkansas.gov); Lucas, Claressa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD)

Subject: Hot Springs and Water management plans

When: Tuesday, October 1, 2019 2:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).

Where: Skype Meeting

Thanks Maria and Kurt. Let's shoot for 10/1 at 2:00 pm ET, but we can move it if needed.

And please feel free to forward the invitation to Laura Miller or any other folks that you think may be interested in joining (same for the AR DOH side, Allison).

Best regards,

Jessica

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(855) 348-8390, (Atlanta Dial-in Conference Region)

English (United States)

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[Forgot your dial-in PIN? | Help](#)

From: Said, Maria <maria_said@nps.gov>

Sent: Wednesday, September 18, 2019 3:01 PM

To: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>

Subject: Re: [EXTERNAL] RE: Hot Springs and Water management plans

Hi Kurt,

I think the call will focus on water management plans -- if you think the park would be interested in being part of that discussion, I think it would be fine. We can add Laura Miller and whoever else might be interested in the calendar invite once we have a day/time.

Maria

On Wed, Sep 18, 2019 at 1:49 PM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:

I'm fairly open that week and look forward to talking more. Should we invite a couple people from the Park?

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

On Wed, Sep 18, 2019 at 11:45 AM Said, Maria <maria_said@nps.gov> wrote:

Fantastic.

Tuesday 10/1 is wide open for me too.

The rest of that week I'll be at the IDSA conference and could step out if need be, but it would be less ideal.

Thank you!

Maria

On Wed, Sep 18, 2019 at 11:23 AM Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

Hi Maria,

We're happy to reconvene to discuss WMPs at Hot Springs. Starting tomorrow Troy is going to be traveling internationally, but he's back in the office on the 30th if we could shoot for a time

that week? I'm also looping in Jasen and Claressa in case they can join too, since they bring the ASHRAE perspective and Claressa may be able to speak to the ecology of *Legionella* in this setting.

Right now it looks like Tuesday, 10/1 is wide open for us. Thurs, 10/3 we're free at 3:00 pm and then Friday, 10/4 at 1:00 pm and 3:00 pm ET.

Also, I was hoping we would have heard back from colleagues in Japan by now about any public health recommendations they have for similar settings, but unfortunately we haven't. I do think by the week of the 30th I should be able to do a quick lit review about cases and clusters associated with hot springs and can share any pertinent findings during the call.

Thanks,
Jessica

—
Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NCIRD/DBD/Respiratory Diseases Branch
404.718.5205 lyd7@cdc.gov

From: Said, Maria <maria_said@nps.gov>
Sent: Wednesday, September 18, 2019 9:22 AM
To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Subject: Hot Springs and Water management plans

Hi Laura, Jessica, and Troy,

We (NPS and Arkansas) are trying to figure out the best path forward with the Hot Springs legionella cases. As you know, all the environmental testing has been negative. However, we have had a number of travel-related cases, and, based on Arkansas state data, it looks like there might be increased cases in the Hot Springs area generally compared to the rest of the state -- although these data are still being analyzed, and I would leave it to Arkansas to confirm this.

We also have considered more where the hot spring water is going -- apparently, it does not just go to the Quapaw, but it goes to a number of other concession operated businesses (including another spa) as well businesses outside park property (including a hospital therapeutic pool and at least one other hotel). One action we are considering is sending a letter to those who receive spa water and basically recommending that although we have never identified legionella in the water and don't know of any increased risk, we do know that untreated water does pose a risk for legionella growth, and businesses might want to consider a water management plan. My feeling is that it would be beneficial to them, if we have an additional case, to then be able to clearly describe their water system and the results of some pre-determined parameters (such as temperatures) over time.

If you all are available at any time, I would love to get your thoughts. Some questions I have are:

- Is a water management plan appropriate even for those buildings that don't meet ASHRAE building guidance criteria?
- Is a water management plan needed for only places that don't disinfect? I know that water management plans are used by many systems in which chlorine is used, but in this case, in which we don't have any evidence of Legionella growth in the hot spring water, I don't think we can or should point to hot spring water as a particular Legionella risk -- the risk in my mind is just from the fact that it is not disinfected.
- Should any of the water management plans include legionella testing? I think the Quapaw might consider this -- but then what would be the guidance if they get positive results?

I am including Allison, the new EIS officer for Arkansas on the thread. Dirk Haselow is no longer with the state health department.

Thanks for any thoughts on this. Hope you guys are well.
Maria

--

Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

--

Maria Said, MD, MIIS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Lucas, Claressa (CDC/DDID/NCIRD/DBD)
Sent: 1 Oct 2019 17:01:28 +0000
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Smith, Jessica (CDC/DDID/NCIRD/DBD); Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD); Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: RE: Hot Springs and Water management plans

(b)(5)

From: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>
Sent: Tuesday, October 1, 2019 12:56 PM
To: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Thanks again.

I think (b)(5)
(b)(5)
(b)(5) All things to consider.

Jasen

From: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Sent: Tuesday, October 1, 2019 12:51 PM
To: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Yeah, and (b)(5)
(b)(5)

From: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>
Sent: Tuesday, October 1, 2019 12:49 PM
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

I think (b)(5)
(b)(5)

(b)(3)

From: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>

Sent: Tuesday, October 1, 2019 12:29 PM

To: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>

Subject: RE: Hot Springs and Water management plans

Super helpful. (b)(3)

(b)(3)

(b)(3)

Are others interpreting this the same?

(b)(3)

(b)(3)

From: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>
Sent: Tuesday, October 1, 2019 11:45 AM
To: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Thank you Jess!

Just in case you haven't seen these papers/abstracts, I am forwarding what it seems the most relevant (please see attached).

(b)(3)

Thank you,
Natalia

From: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Sent: Tuesday, October 1, 2019 10:27 AM

To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Hi all — Before this call at 2 pm today, I thought I'd pass along this guidance from Japan that seems relevant:

(b)(3)

(b)(3)

(b)(3)

-----Original Appointment-----

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)

Sent: Wednesday, September 18, 2019 5:05 PM

To: Smith, Jessica (CDC/DDID/NCIRD/DBD); Said, Maria; Kesteloot, Kurt; Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Edens, William (Chris) (CDC/DDID/NCIRD/DBD)

Cc: Cooley, Laura A. (CDC/DDID/NCIRD/DBD); James, Allison (CDC arkansas.gov); Lucas, Claessa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD)

Subject: Hot Springs and Water management plans

When: Tuesday, October 1, 2019 2:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).

Where: Skype Meeting

Thanks Maria and Kurt. Let's shoot for 10/1 at 2:00 pm ET, but we can move it if needed.

And please feel free to forward the invitation to Laura Miller or any other folks that you think may be interested in joining (same for the AR DOH side, Allison).

Best regards,

Jessica

Join Skype Meeting

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(855) 348-8390, (Atlanta Dial-in Conference Region)

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From: Said, Maria <maria_said@nps.gov>

Sent: Wednesday, September 18, 2019 3:01 PM

To: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Lucas, Claessa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>

Subject: Re: [EXTERNAL] RE: Hot Springs and Water management plans

Hi Kurt,

I think the call will focus on water management plans -- if you think the park would be interested in being part of that discussion, I think it would be fine. We can add Laura Miller and whoever else might be interested in the calendar invite once we have a day/time.

Maria

On Wed, Sep 18, 2019 at 1:49 PM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:

I'm fairly open that week and look forward to talking more. Should we invite a couple people from the Park?

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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On Wed, Sep 18, 2019 at 11:45 AM Said, Maria <maria_said@nps.gov> wrote:

Fantastic.

Tuesday 10/1 is wide open for me too.

The rest of that week I'll be at the IDSA conference and could step out if need be, but it would be less ideal.

Thank you!

Maria

On Wed, Sep 18, 2019 at 11:23 AM Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

Hi Maria,

We're happy to reconvene to discuss WMPs at Hot Springs. Starting tomorrow Troy is going to be traveling internationally, but he's back in the office on the 30th if we could shoot for a time that week? I'm also looping in Jasen and Claressa in case they can join too, since they bring the

ASHRAE perspective and Claressa may be able to speak to the ecology of *Legionella* in this setting.

Right now it looks like Tuesday, 10/1 is wide open for us. Thurs, 10/3 we're free at 3:00 pm and then Friday, 10/4 at 1:00 pm and 3:00 pm ET.

Also, I was hoping we would have heard back from colleagues in Japan by now about any public health recommendations they have for similar settings, but unfortunately we haven't. I do think by the week of the 30th I should be able to do a quick lit review about cases and clusters associated with hot springs and can share any pertinent findings during the call.

Thanks,
Jessica

—

Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NCIRD/DBD/Respiratory Diseases Branch
404.718.5205 lyd7@cdc.gov

From: Said, Maria <maria_said@nps.gov>
Sent: Wednesday, September 18, 2019 9:22 AM
To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Subject: Hot Springs and Water management plans

Hi Laura, Jessica, and Troy,

We (NPS and Arkansas) are trying to figure out the best path forward with the Hot Springs legionella cases. As you know, all the environmental testing has been negative. However, we have had a number of travel-related cases, and, based on Arkansas state data, it looks like there might be increased cases in the Hot Springs area generally compared to the rest of the state -- although these data are still being analyzed, and I would leave it to Arkansas to confirm this.

We also have considered more where the hot spring water is going -- apparently, it does not just go to the Quapaw, but it goes to a number of other concession operated businesses (including another spa) as well businesses outside park property (including a hospital therapeutic pool and at least one other hotel). One action we are considering is sending a letter to those who receive spa water and basically recommending that although we have never identified legionella in the water and don't know of any increased risk, we do know that untreated water does pose a risk for legionella growth, and businesses might want to consider a water management plan. My feeling is that it would be beneficial to them, if we have an additional case, to then be able to clearly describe their water system and the results of some pre-determined parameters (such as temperatures) over time.

If you all are available at any time, I would love to get your thoughts. Some questions I have are:

- Is a water management plan appropriate even for those buildings that don't meet ASHRAE building guidance criteria?
- Is a water management plan needed for only places that don't disinfect? I know that water management plans are used by many systems in which chlorine is used, but in this case, in which we don't have any evidence of Legionella growth in the hot spring water, I don't think we can or should point to hot spring water as a particular Legionella risk -- the risk in my mind is just from the fact that it is not disinfected.
- Should any of the water management plans include legionella testing? I think the Quapaw might consider this -- but then what would be the guidance if they get positive results?

I am including Allison, the new EIS officer for Arkansas on the thread. Dirk Haselow is no longer with the state health department.

Thanks for any thoughts on this. Hope you guys are well.
Maria

--

Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

--

Maria Said, MD, MHS | CDR, U.S. Public Health Service
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Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Kesteloot, Kurt
Sent: 4 Oct 2019 06:47:44 -0500
To: Mark Scott;laura_a_miller@nps.gov
Cc: Lucas, Claressa (CDC/DDID/NCIRD/DBD);Smith, Jessica (CDC/DDID/NCIRD/DBD);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Maria Said;Robert Kammel
Subject: 10-4-19 Legionella Sampling Plan
Attachments: HOSP Thermal Water Sampling Plan 10-4-19.pdf

Good Morning Everyone,

Mark and I talked yesterday about the attached sampling plan for today. I have attached a drawing that lists the samples and shows a rough overview of the system. If anyone has any additional thoughts, comments, or questions, please let me know.

Currently, I have 23 locations listed. Thus, we have two more available if needed. I have not listed the thermal water system main tank under administration because it has been tested at least three times (once with PCR/new lab) and has been negative all times. I have also excluded the showers in the Quapaw because they were plumbed improperly and will not be used that way ever again. All of the tests focus on the NPS water system, we could talk to the city about testing their fountains and/or test the city water in the Quapaw (showers on main level and one in the basement). Any thoughts?

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

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On Thu, Oct 3, 2019 at 3:50 PM Maria Said <maria_said@nps.gov> wrote:

Thanks Claressa. And to take it one step further, positive PCR results will be much less useful, right? My understanding is that they are not accurate for predicting culture results and we would just have to wait for cultures to be finalized, correct?

Thank you again!

Maria Said, MD, MHS
CDR, US Public Health Service
Epidemiology Branch Chief
Office of Public Health
National Park Service
(O) 202-513-7151
(C) 202-538-5682

> On Oct 3, 2019, at 3:52 PM, Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov> wrote:
>
> Hi Maria,
> Yes, negative PCR results are >99% predictive of a negative culture result.
>
> Best wishes,
> Claressa
>
> -----Original Message-----
> From: Maria Said <maria_said@nps.gov>
> Sent: Thursday, October 3, 2019 3:49 PM
> To: James, Allison (CDC arkansas.gov) <allison.jamcs@arkansas.gov>;
> jennifer.dillaha@arkansas.gov; Kurt Kesteloot <kurt_kesteloot@nps.gov>;
> laura_a_miller@nps.gov; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>;
> Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter,
> Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>
> Subject: Re: PCR?
>
> It looks from the lab that PCR results would be available the next day after testing.
>
> Claressa, am I correct that negative PCR results are highly predictive that culture results will be negative as well?
>
> It seems to me that if we are able to get this information quickly, that will be very helpful to us in determining our modes of notification.
>
> Thank you! Maria
>
> Maria Said, MD, MHS

> CDR, US Public Health Service
> Epidemiology Branch Chief
> Office of Public Health
> National Park Service
> (O) 202-513-7151
> (C) 202-538-5682

>

>

>> On Oct 3, 2019, at 3:40 PM, Maria Said <maria_said@nps.gov> wrote:

>>

>> Does anyone know how quickly PCR results could be turned around? My
>> understanding of PCR is that negative PCR has a high predictive value and could
be very useful in this situation if we can get results quickly. Thanks. Maria

>>



Hot Springs National Park

Thermal Spring Water Distribution System Flow Chart

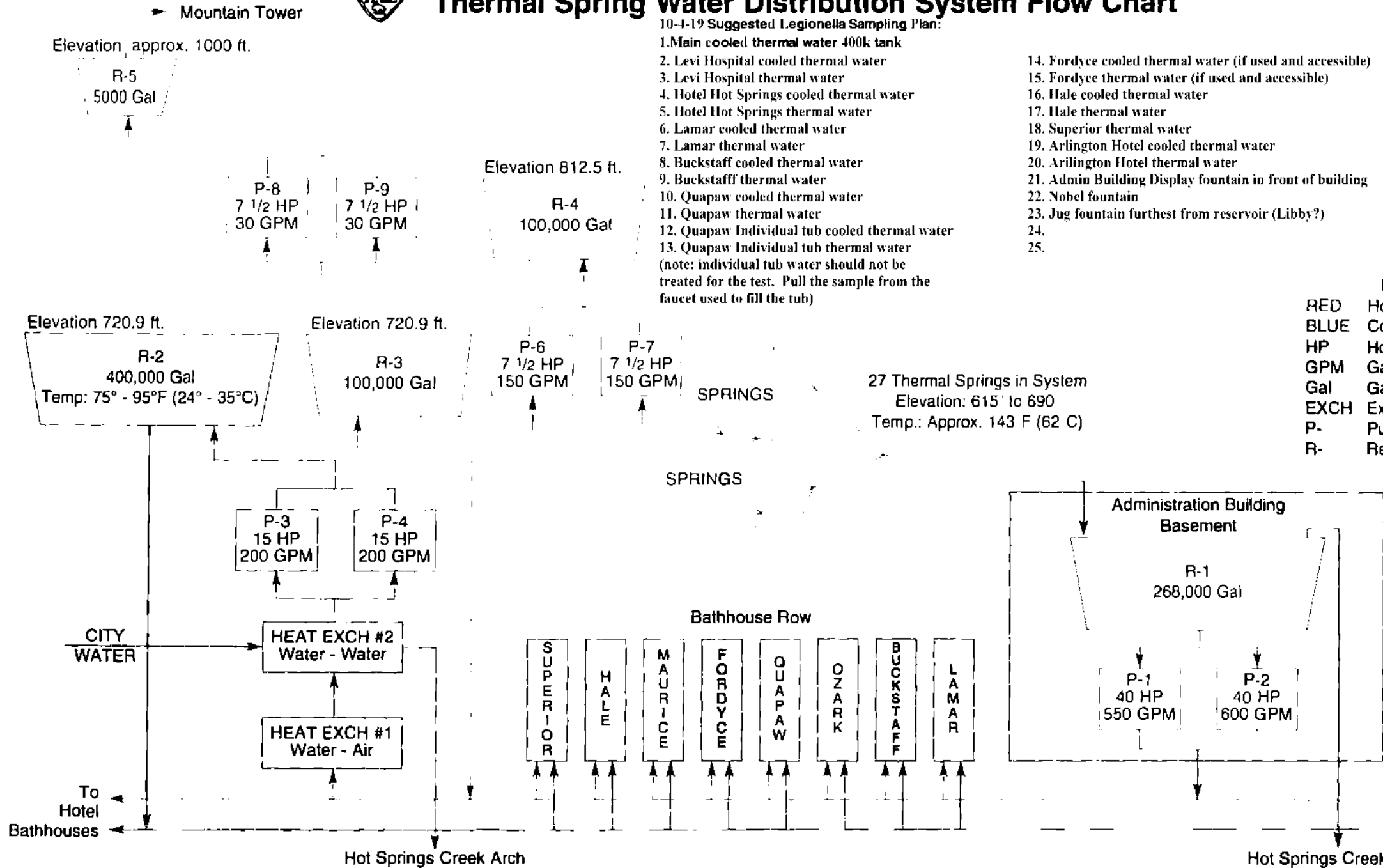
10-4-19 Suggested Legionella Sampling Plan:

1. Main cooled thermal water 400k tank
 2. Levi Hospital cooled thermal water
 3. Levi Hospital thermal water
 4. Hotel Hot Springs cooled thermal water
 5. Hotel Hot Springs thermal water
 6. Lamar cooled thermal water
 7. Lamar thermal water
 8. Buckstaff cooled thermal water
 9. Buckstaff thermal water
 10. Quapaw cooled thermal water
 11. Quapaw thermal water
 12. Quapaw Individual tub cooled thermal water
 13. Quapaw Individual tub thermal water
- (note: individual tub water should not be treated for the test. Pull the sample from the faucet used to fill the tub)

14. Fordyce cooled thermal water (if used and accessible)
15. Fordyce thermal water (if used and accessible)
16. Hale cooled thermal water
17. Hale thermal water
18. Superior thermal water
19. Arlington Hotel cooled thermal water
20. Arlington Hotel thermal water
21. Admin Building Display fountain in front of building
22. Nobel fountain
23. Jug fountain furthest from reservoir (Libby?)
- 24.
- 25.

LEGEND:

- RED Hot thermal water
- BLUE Cooled thermal water
- HP Horse Power
- GPM Gallons Per Minute
- Gal Gallons
- EXCH Exchanger
- P- Pump
- R- Reservoir



THE THERMAL WATER DISTRIBUTION SYSTEM OF HOT SPRINGS NATIONAL PARK

Systems for distributing thermal spring water at Hot Springs National Park have been around a long time, evolving along with the bathhouses. In the first half of the nineteenth century most "bathhouses" were rough wooden shacks or even tents, built over natural tufa cavities (sometimes enlarged) that held spring water. More elaborate bathhouses began springing up in the 1850s. Some boasted individual bath rooms with wooden tubs, requiring a network of wooden troughs to direct thermal water into flumes on the roofs. Inside the bathhouse, bathers pulled a rope, opening a mechanism that released water from the flume into the tub.

When a disastrous 1878 fire destroyed most of the bathhouses along Hot Springs Creek, the government seized the opportunity to improve both bathhouse construction and thermal water distribution. The Avenue Hotel Bathhouse, built in 1880, was allowed to set up a pump on the reservation. The first reservoir was built in 1880 as well. On June 8, 1891, a pumping station and reservoir were completed on the present site of the administration building in order to enhance thermal water distribution. Unfortunately a law passed that same year required water to be transported by gravity flow, and the pumping equipment was never used.

The government built more reservoirs in the 1890s to impound spring water and increase the flow. In 1897 all but four springs were encased in brick archways and their water piped to bathhouses and reservoirs; the remaining springs were enclosed by 1901. On November 10, 1903, Congress authorized funds for building surface and deep reservoirs on Hot Springs Mountain, adding to the collection of older reservoirs already in use. In 1924 National Park Service engineers drew a plan showing the existing complex of springs, reservoirs, and plumbing in preparation for the first central collection, impounding and distribution system for the thermal water, completed around 1931. Meters installed on bathhouse lines were not fully functional until 1933. The present system allows better control and monitoring of the water flow.

The springs are located on about 2.8 acres along Bathhouse Row and the Grand Promenade. The bulk of the approximately 850,000 gallons of thermal water flowing each day from Hot Springs Mountain is collected from 27 of the 47

presently active springs. Each spring in the collection system has been sealed and covered with a green box about four feet square with a metal cover, chain, and padlock. The green boxes on the lower west slope of Hot Springs Mountain and the heat exchange units at the north end of Bathhouse Row are the most visible components of the thermal water distribution system and represent its source portion. Not all of the boxes indicate a spring; some hold only valves and collection plumbing. The boxes higher up on the mountain allow access to the underground reservoirs and plumbing.

The valve and spring collection boxes are connected with the plumbing system delivering thermal water to reservoir R-1 under the east end and parking lot of the administration building at the south end of Bathhouse Row. This reservoir holds about 268,000 gallons and includes an overflow pipe connected to the Hot Springs Creek arch.

In the administration building basement, two pumps (P-1 and P-2) move the thermal water through a twelve-inch cast-iron pipe in the Hot Springs Creek arch to the bathhouses, the heat exchangers, and a 100,000-gallon underground storage reservoir (R-3) about 120 feet above Bathhouse Row. The elevation of this reservoir ensures an ample supply of water at about 52 pounds per square inch (psi) when pumps P-1 and P-2 are idle. When demand increases, pumps P-6 and P-7 transfer thermal water from reservoir R-3 to another 100,000-gallon reservoir (R4) about 220 feet above Bathhouse Row. The plumbing for a number of bathhouses no longer in operation is still in the distribution system as well.

Surprisingly enough the water within the distribution system stays well above 100°F (37.8°C); the water has been flowing into it for decades, and the terrain around the reservoirs and plumbing is heat saturated. As a result, the water arriving at the bathhouses is far too hot for direct bathing. By the 1890s most of the bathhouses had individual cooling towers to cool down the thermal water. These and similar towers were used until the central thermal water cooling system was completed on February 8, 1950. The system is comprised of two heat exchangers (#1 and #2), two pumps (P-3 and P-4), and a 400,000-gallon reservoir (R-2). The first exchanger is a thermal water-to-air cooling unit that works like a car radiator; it contains a primary and secondary section,

each with a large fan to force air through its radiator cores. When both sections of heat exchanger #1 are unable to cool the water sufficiently, #2 comes on line. This exchanger runs cold city water over the tubes carrying the thermal water but never mixes with it. The city water, which is heated in the process, is discharged into the Hot Springs Creek arch, and pumps P-3 and P-4 move the cooled thermal water (still 100% spring water) into reservoir R-2. This reservoir is next to and at the same elevation as reservoir R-3, so an ample supply of cooled water is also available at about 52 psi. The system for delivering cooled thermal water is similar to the hot spring water distribution system.

By mixing hot and cooled spring water, attendants can administer baths at the temperature (98° to 100°F, 36.7° to 37.8°C) required by regulations. The system was designed to produce thermal water cooled to temperatures ranging from 75° to 90°F (24° to 32.2°C). During most of the year when outdoor temperatures are below 80°F (26.7°C), the system works well, but during the hot summer months the desired temperature range is difficult to achieve. To compensate, heat exchanger #2 has been redesigned, and installation of new equipment began in the first quarter of fiscal year 2001.

The entire system is monitored automatically from the basement of the park administration building. The quantity and temperature of the water coming in from the springs are recorded continuously for 24 hours a day, as are water levels in each reservoir. Meters at each bathhouse transmit readings on the amount of water used to the monitoring center. Analyses of these data alert maintenance workers to the possibility of major leaks or equipment failure.

One source of equipment failure is the buildup of calcium carbonate, or limestone, in the system. Similar to the water found in caves, the spring water contains dissolved limestone that can be deposited in pipes, valves, and other system components, particularly in those handling cooled spring water. Because calcium carbonate is less soluble in cold water, it settles out in greater quantities in cooled water systems. Also called "tufa," the deposit is left wherever the thermal springs flow. In fact, the porous gray tufa formations behind Bathhouse Row are really geological "maps" showing where the springs once flowed freely down the mountainside.

From: Kesteloot, Kurt
Sent: 11 Jul 2019 23:21:38 -0500
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Terry.Paul@arkansas.gov
Cc: Sara Newman;Said, Maria
Subject: DRAFT Sampling Plan for Tomorrow's Discussion
Attachments: Legionella DRAFT Sampling Plan 7-11-19.docx, HOSP_Legionella testing DRAFT.pdf, Presentation2.pdf

Good Evening Troy and Terry,

I will try to call you both tomorrow morning sometime. Hopefully around 0700 CDT. I have attached a few documents for your review. These are just a draft and need more review as it is late and I wanted to have something to share with you for our discussion. I have attached old system plans with comments, a MS Word document, and photos.

Talk to you tomorrow.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service,Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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Cold Thermal System:

- Sheets two and three of 12 show the location of the cooling tower. Bulk samples are recommended immediately after the cooling towers
- Bulk samples are recommended from the cold thermal line in the Quapaw.
- Any other cooling tower recommendations. Closest a visitor gets to a tower is about 20 ft.

Decorative fountains:

- Sheet 8 of 12 shows the Display fountain and Nobel fountain. It is recommended that both are bulk tested and swabbed if they are in operation.
- Per sheet 2 of 12 there is another fountain in the Arlington lawn that it is recommended to be swabbed and bulk sampled.
- Per sheet 4 of 12, there are two fountains between the Maurice and Fordyce and it is recommended they are both swabbed and bulk tested.
- Are there other decorative fountains that should be tested that I have not listed?

Quapaw Water Processes/Facility:

- Aroma therapy: What is it and is there anything we can test? Swab and bulk sample if possible
- Sheet 4 of 12 shows a 37'8" reservoir under the rooms in the basement of the Quapaw. A swab or two are recommended along with a bulk sample. Test the room(s) closest to the two cases if possible with a swab from opening the hatch.
- There are multiple single use spa tubs in the basement. A mixed bulk sample and swab from multiple or all tubs is recommended if we do not know if the two cases used the same tub.
- Swab the area next to the spring box exposed in the cave and the cave wall if possible. Also verify temperature in the cave.
- Basement fountain?
- Anything else they do with water in the basement?
- Fountains in community pools above?

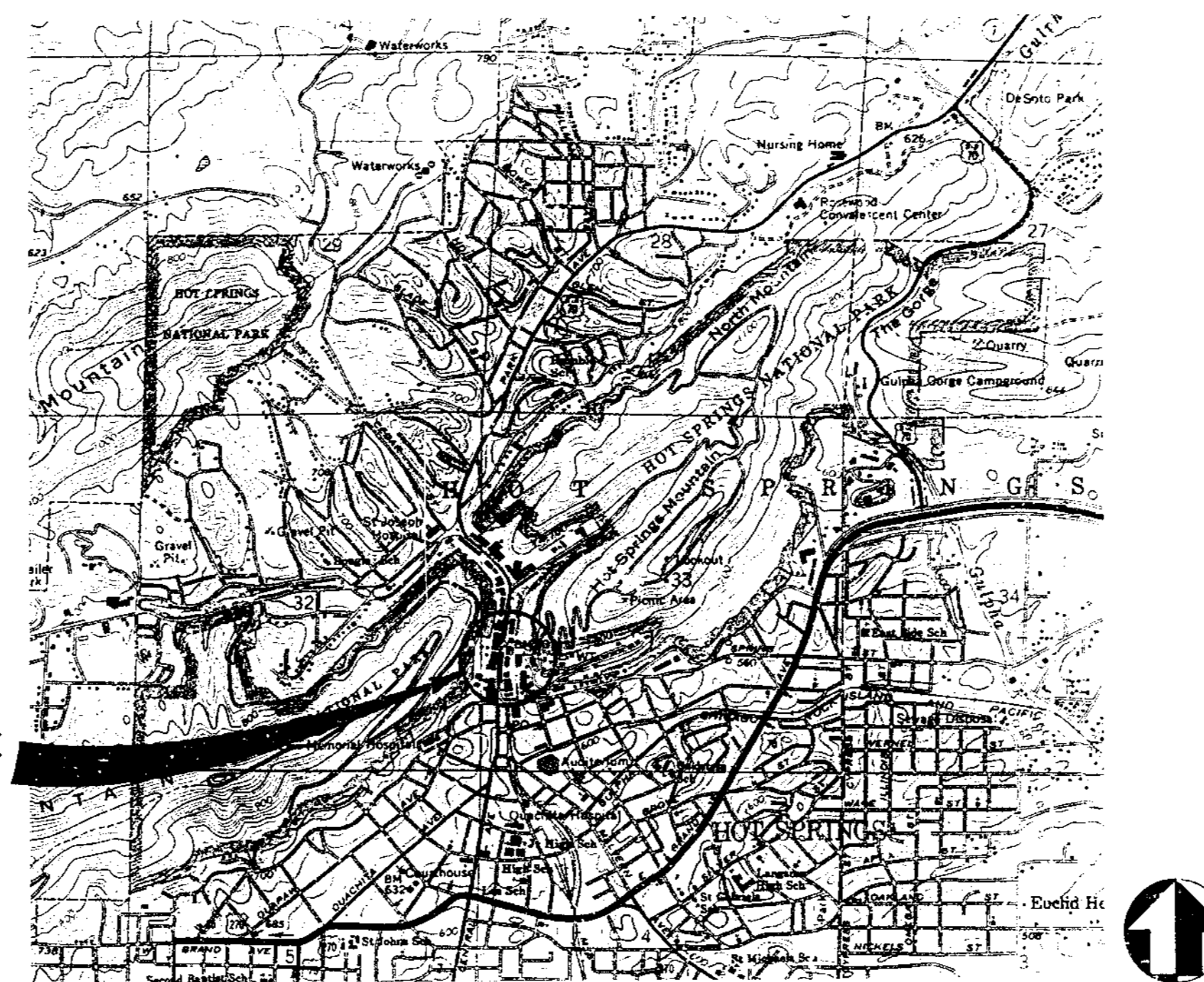
Other areas in the park?

Hot Springs National Park

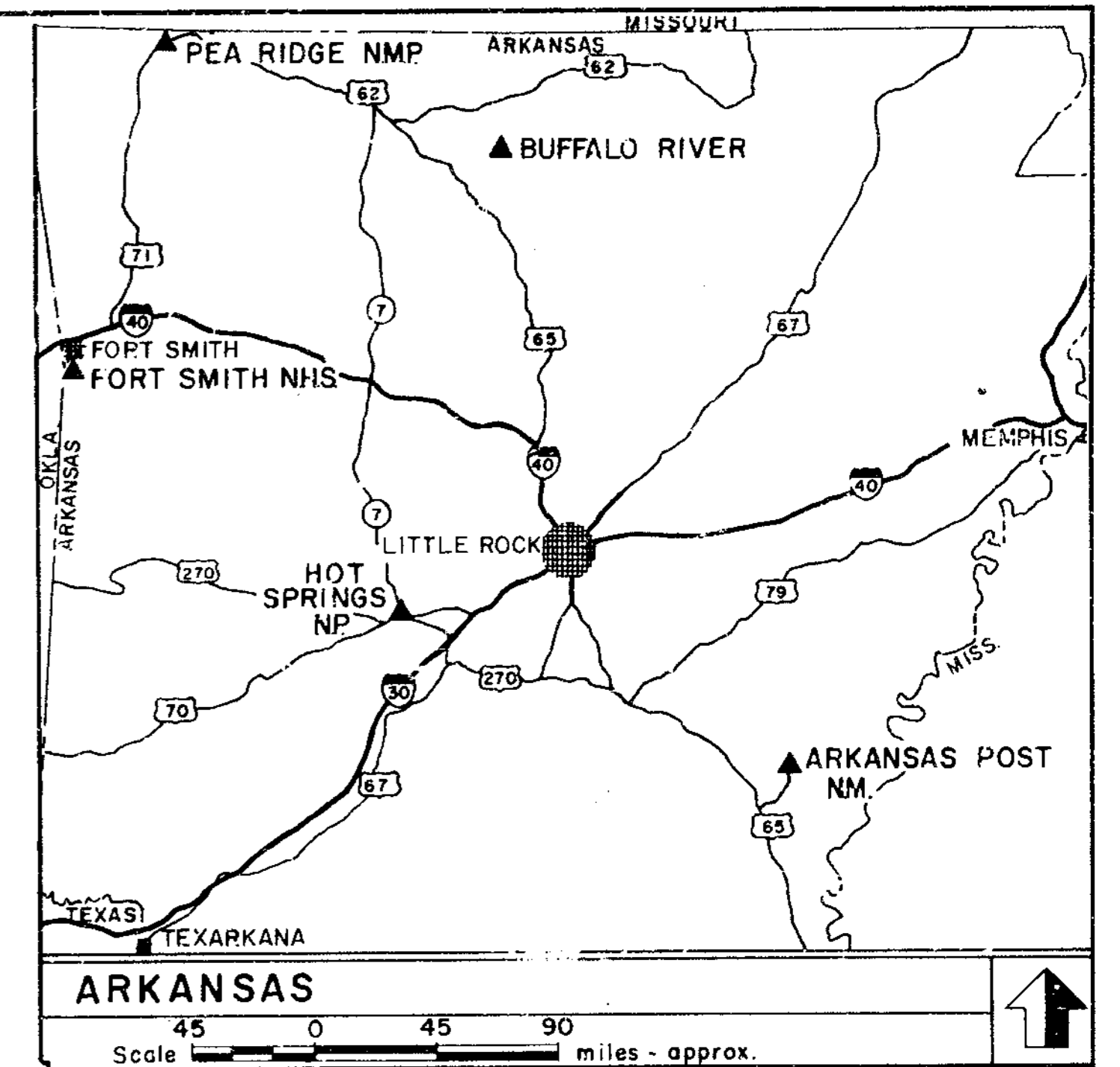
Thermal Water Collection and Distribution System

GENERAL NOTES

1. LOCATIONS OF THE THERMAL WATER COLLECTION AND DISTRIBUTION SYSTEM AND APPURTENANCES WERE OBTAINED FROM SURFACE FIELD INSPECTIONS AND AS-BUILT DRAWINGS. NO SUB-SURFACE EXPLORATION WAS ATTEMPTED TO AVOID DISTURBANCES OF THE PARK.
2. SPRING FLOW RATES AND TEMPERATURES WERE MEASURED IN 1976 PRIOR TO CONSTRUCTION OF THE EXISTING COLLECTION SYSTEM.
3. ALL HW PIPE IS 6-INCH OR 10-INCH DIAMETER, 2-INCH FACTORY INSULATED (EXTERIOR), EPOXY LINED DUCTILE IRON PIPE CONVEYING HOT WATER.
4. ALL CW PIPE IS 6-INCH OR 8-INCH DIAMETER, EPOXY LINED, DUCTILE IRON PIPE CONVEYING COOLED WATER.
5. ALL CP PIPE IS 4-INCH, 6-INCH, OR 8-INCH DIAMETER CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPE CONVEYING HOT WATER. THE 4-INCH AND 6-INCH PIPE WAS INSTALLED INSIDE 6-INCH AND 8-INCH DIAMETER POLYVINYL CHLORIDE (PVC) PIPE, RESPECTIVELY.
6. ALL FCP PIPE IS 1/2-INCH, 2-INCH, 4-INCH, OR 6-INCH DIAMETER "SILVER THREAD" FIBERGLASS PIPE CONVEYING HOT WATER. THE 4-INCH AND 6-INCH PIPE WAS INSTALLED INSIDE 6-INCH OR 8-INCH DIAMETER ASBESTOS-CEMENT PIPE, RESPECTIVELY.
7. ALL TEMPERATURES SHOWN ARE DEGREES FAHRENHEIT.



VICINITY MAP
SCALE OF FEET



ABBREVIATIONS

AC	ASBESTOS CEMENT PIPE
BM	BENCHMARK
CI	CAST IRON PIPE
CL	CENTER LINE
CONC	CONCRETE
CP	COLLECTION PIPE
CP	COPPER PIPE
CW	COOLED WATER PIPE
DIA	DIAMETER
EL	ELEVATION
ELEC	ELECTRICAL
FCP	FIBERGLASS HOT WATER PIPE
GAL	GALLON
GL	GAS PIPELINE
GPD	GALLONS PER DAY
GV	GATE VALVE
HW	HOT WATER
INCL	INCLUDED
MH	MANHOLE
PVC	POLYVINYL CHLORIDE PIPE
SS	SANITARY SEWER
STA	STATION
TBM	TEMPORARY BENCHMARK
VC	VITRIFIED CLAY PIPE
WL	CITY WATER LINE

LEGEND

SYMBOL	DESCRIPTION
---	HOT WATER PIPELINES
---	COOLED WATER PIPELINES
---	ELECTRICAL CONDUIT
---	SPRING COLLECTION PIPELINES
+++++	GAS PIPELINES
---v---	VERTICAL WALL

BATHHOUSE ROW

INDEX


1. COVER SHEET
2. ARLINGTON LAWN AREA
3. BATHHOUSE ROW-PLAN & PROFILE
4. BATHHOUSE ROW-PLAN & PROFILE
5. BATHHOUSE ROW-PLAN & PROFILE
6. UPPER RESERVOIR PIPELINE - PLAN & PROFILE
7. SPRING COLLECTION GROUP #2
8. SPRING COLLECTION GROUP #2
9. DETAILS
10. PROCESS AND INSTRUMENTATION DIAGRAMS
11. PROCESS AND INSTRUMENTATION DIAGRAMS
12. ONE LINE - ELECTRICAL

REFERENCE DRAWINGS

1. NP HS-4784 (1930)
2. NP HS-2043 (1948)
3. NP HS-5311C (1948)
4. 128 41,015A (1978)
5. 128 41,021A (1985)
6. 128 60,001 (1981)
7. 128 41,023B (1987)
8. 128 60,190 (1978)
9. 128 41,031A (1987)

REDUCED SIZE REPRODUCTION

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Mark	Sheet	REVISION	Date	Initial

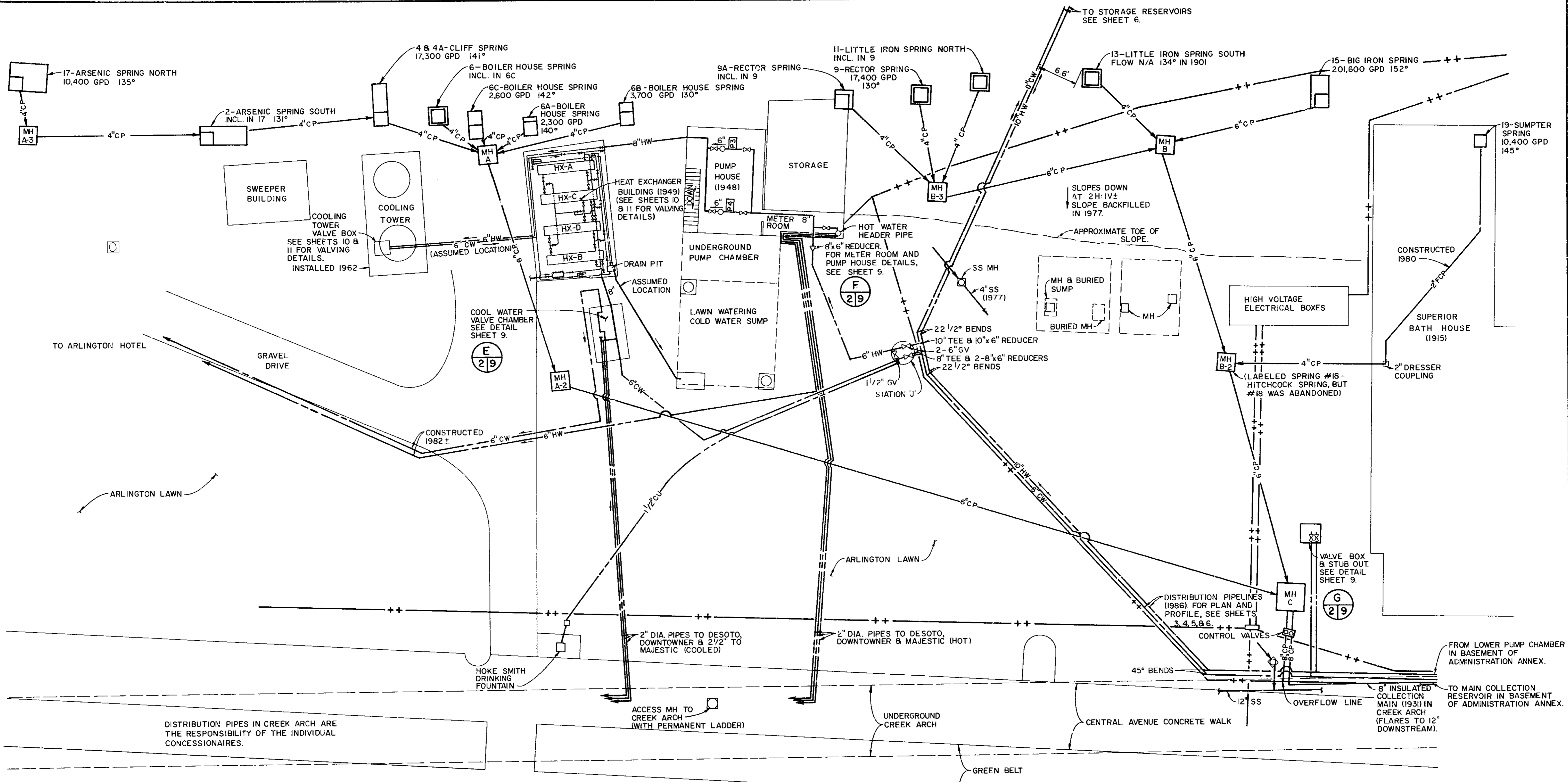
This drawing has been prepared in compliance with Preliminary/Comprehensive Design Drawing No. _____
Approved by _____
Title _____ Date _____
Assistant Manager Date _____

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DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
DENVER SERVICE CENTER

DESIGNED: JACOBS
DRAWN: MJNEIMES
TECH. REVIEW: _____
DATE: 4/1988

TITLE OF SHEET
EXISTING CONDITIONS OF THE THERMAL WATER COLLECTION & DISTRIBUTION SYSTEM
LOCATION WITHIN PARK
BATHHOUSE ROW
NAME OF PARK
HOT SPRINGS NATIONAL PARK
SOUTHWEST REGION GARLAND COUNTY ARKANSAS STATE

DRAWING NO. 128
41,035
PKG. NO. 1
SHEET 1
OF 12

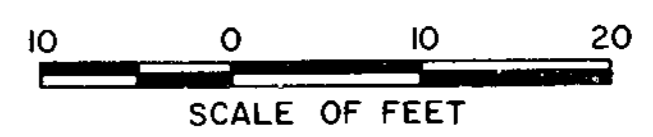


REFERENCE DRAWINGS

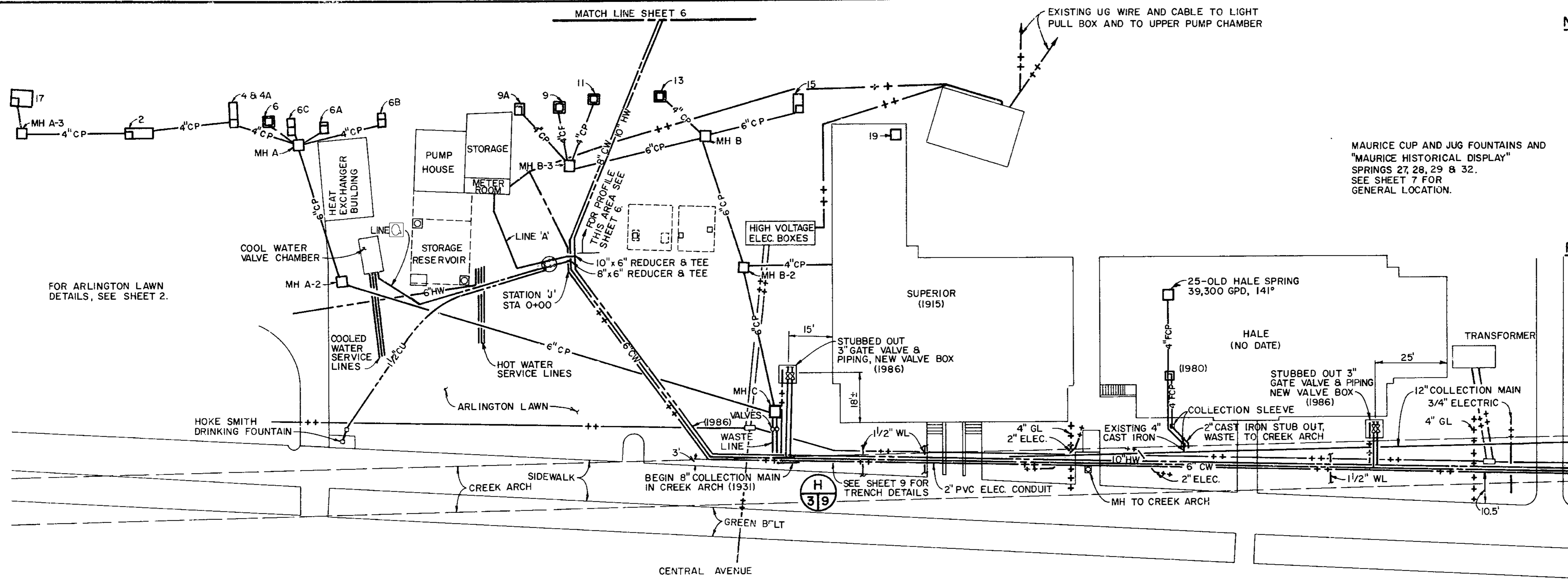
- 1. I28 41,015 A (1978)
- 2. I28 41,021 A (1985)
- 3. I28 60,001 (1981)
- 4. I28 41,023 B (1987)
- 5. I28 60,100 (1978)
- 6. NP HS-4784 (1930)
- 7. NP HS-531C (1948)
- 8. NP HS-2043 (1948)
- 9. I28 41,031A (1987)

- 4. LAWN SPRINKLER SYSTEM NOT SHOWN, BUT CONSISTS OF GALVANIZED PIPE AND PLASTIC PIPE UNDER MOST OF ARLINGTON LAWN.
- 5. FOR LEGEND, GENERAL NOTES, AND ABBREVIATIONS, SEE SHEET 1.
- 6. LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.
- 7. VALVES, METERS, PUMPS, AND DISTRIBUTION PIPING ARE SHOWN ON THE PROCESS AND INSTRUMENTATION DIAGRAMS SHOWN ON SHEETS 10 AND 11.
- 8. ALL SPRINGS SHOWN ON THIS SHEET ARE COLLECTED.

- NOTES**
- 1. SPRING BOXES AND COLLECTION PIPES THIS SHEET CONSTRUCTED 1977 EXCEPT AS NOTED.
 - 2. DISTRIBUTION LINES CONSTRUCTED 1986.
 - 3. ABANDONED OR PLUGGED LINES NOT SHOWN.



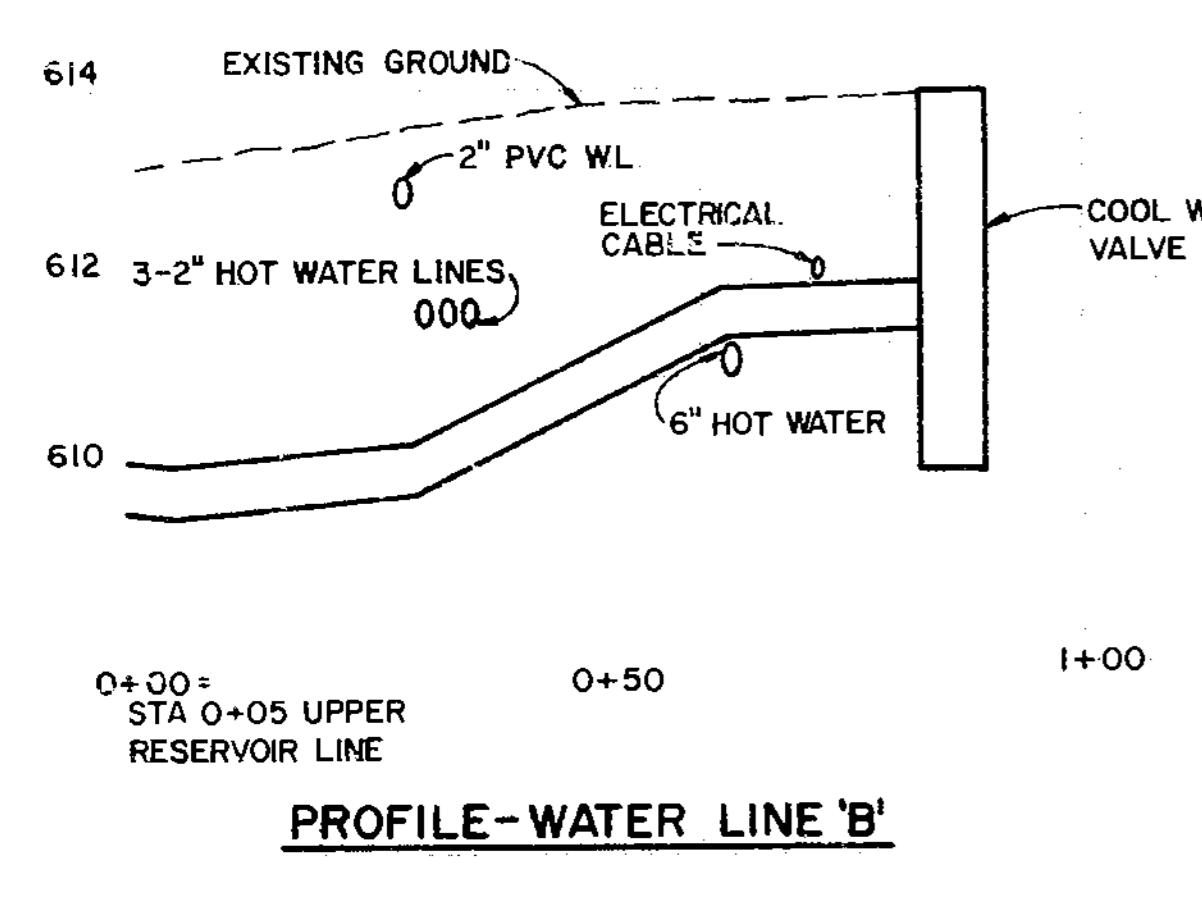
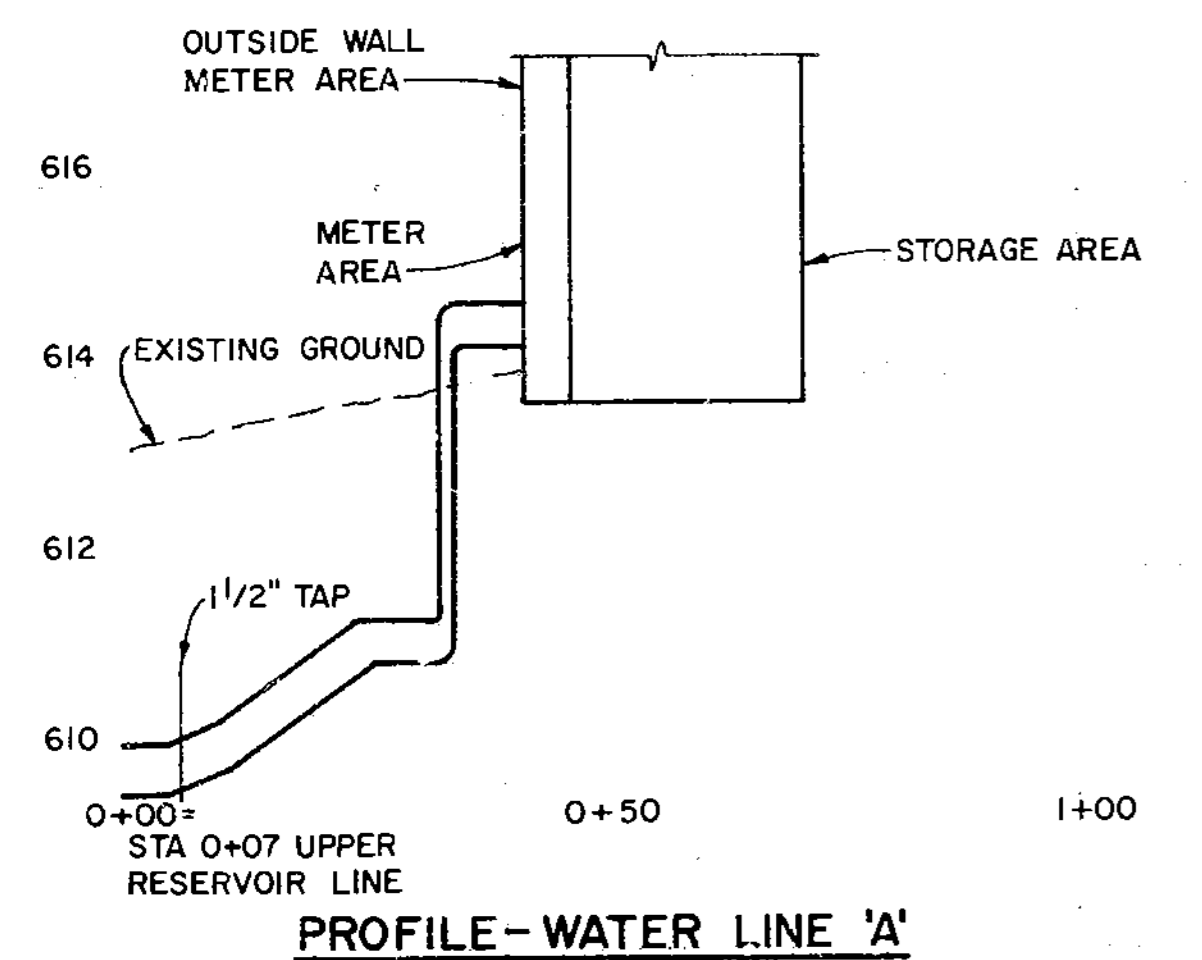
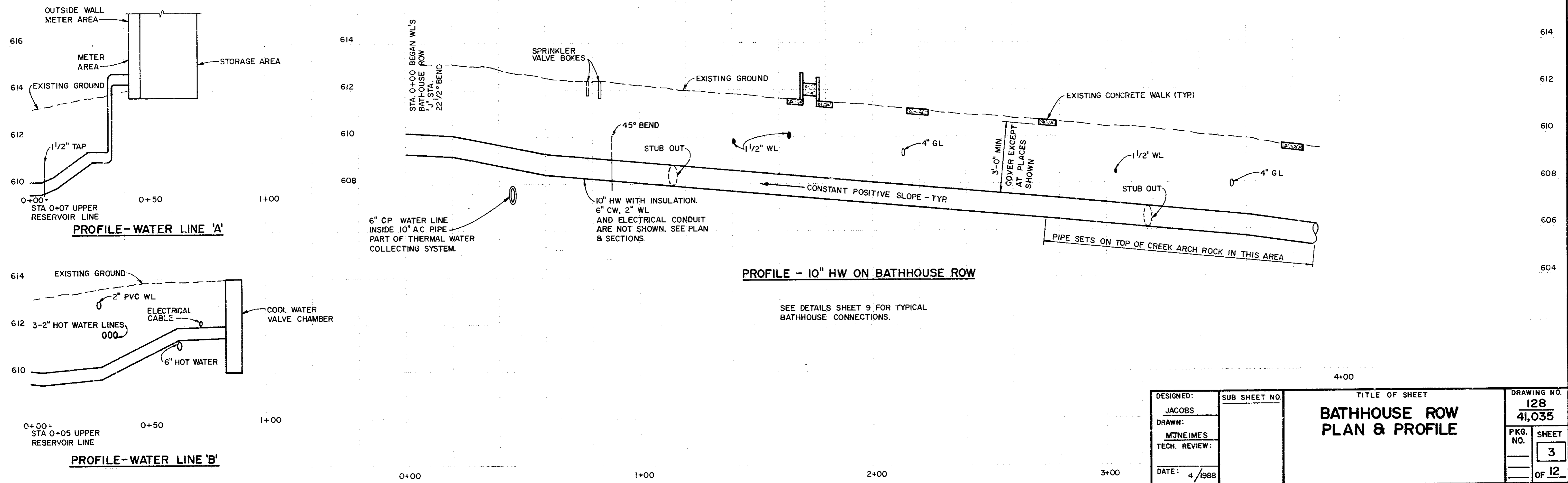
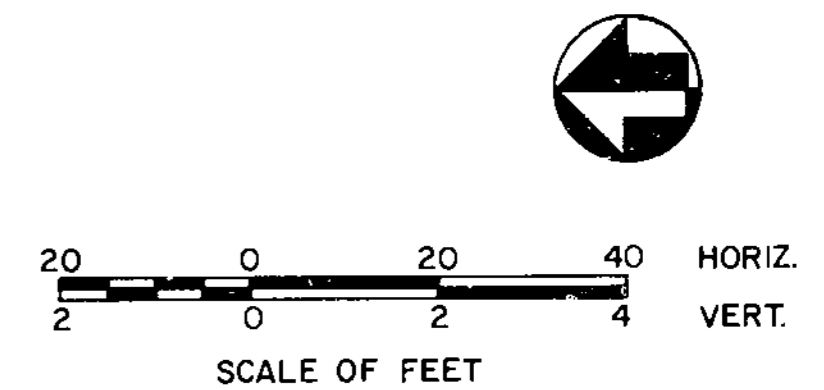
DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET		DRAWING NO.
DRAWN: MONEIMES		ARLINGTON LAWN AREA THERMAL WATER DISTRIBUTION SYSTEM AND SPRING GROUP # 1 COLLECTION SYSTEM		128
TECH. REVIEW:				41,035
DATE: 4/1998		PKG. NO.	SHEET	OF
		2	12	



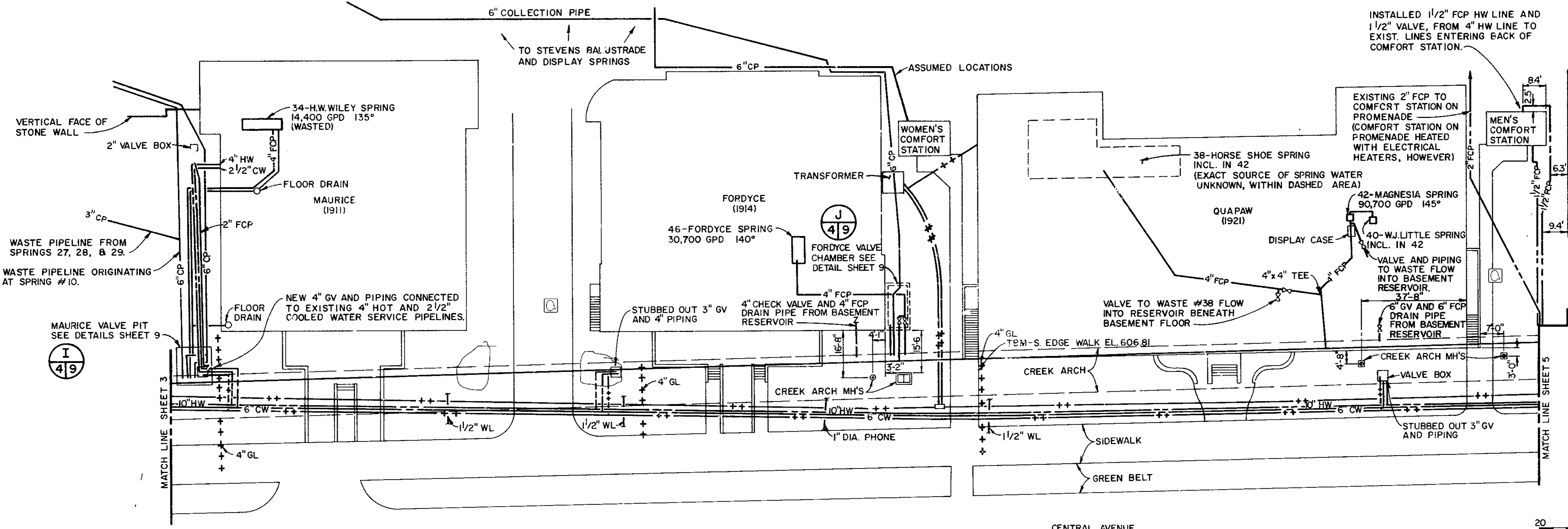
MAURICE CUP AND JUG FOUNTAINS AND "MAURICE HISTORICAL DISPLAY" SPRINGS 27, 28, 29 & 32. SEE SHEET 7 FOR GENERAL LOCATION.

- NOTES**
- FOR LEGEND, GENERAL NOTES, AND ABBREVIATIONS, SEE SHEET 1.
 - SPRING INFORMATION AND ADDITIONAL PIPING DETAILS SHOWN ON SHEET 2.
 - LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.
 - PLUGGED AND/OR ABANDONED PIPE NOT SHOWN.
 - FOR CLARITY, ALL VALVES AND METERS NOT SHOWN. FOR VALVING AND METERING DETAILS, REFER TO SHEETS 10 AND 11.

- REFERENCE DRAWINGS**
- 128 41,015A (1978)
 - 128 41,021A (1985)
 - 128 60,001 (1981)
 - 128 41,023B (1987)
 - 128 41,031A (1987)

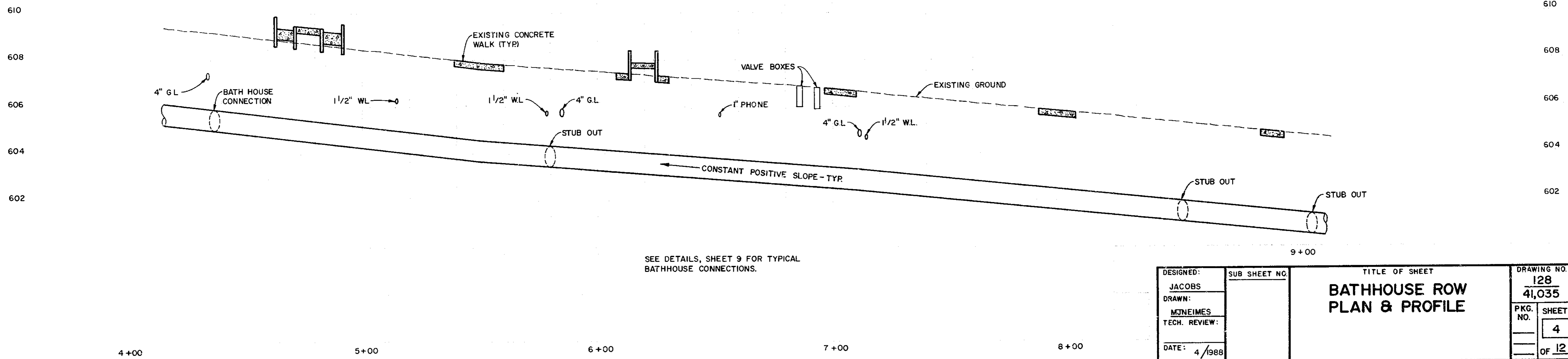
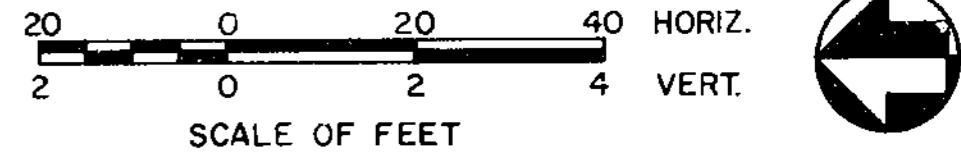


DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET BATHHOUSE ROW PLAN & PROFILE	DRAWING NO. 128 41,035
DRAWN: MJNEIMES			PKG. NO.
TECH. REVIEW:			SHEET 3
DATE: 4/1988			OF 12



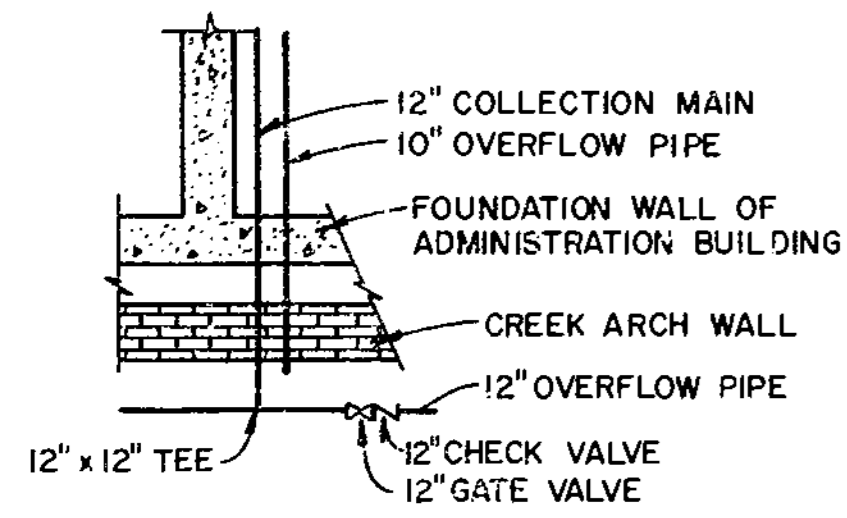
- NOTES**
1. PLUGGED AND OR ABANDONED PIPE NOT SHOWN.
 2. FOR CLARITY, ALL VALVES AND METERS NOT SHOWN. FOR VALVING AND METERING DETAILS, REFER TO SHEETS 10 AND 11.
 3. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS SEE SHEET 1.
 4. LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.

- REFERENCE DRAWINGS**
1. 128 41,021A (1985)
 2. 128 41,023B (1987)
 3. 128 41,031A (1987)

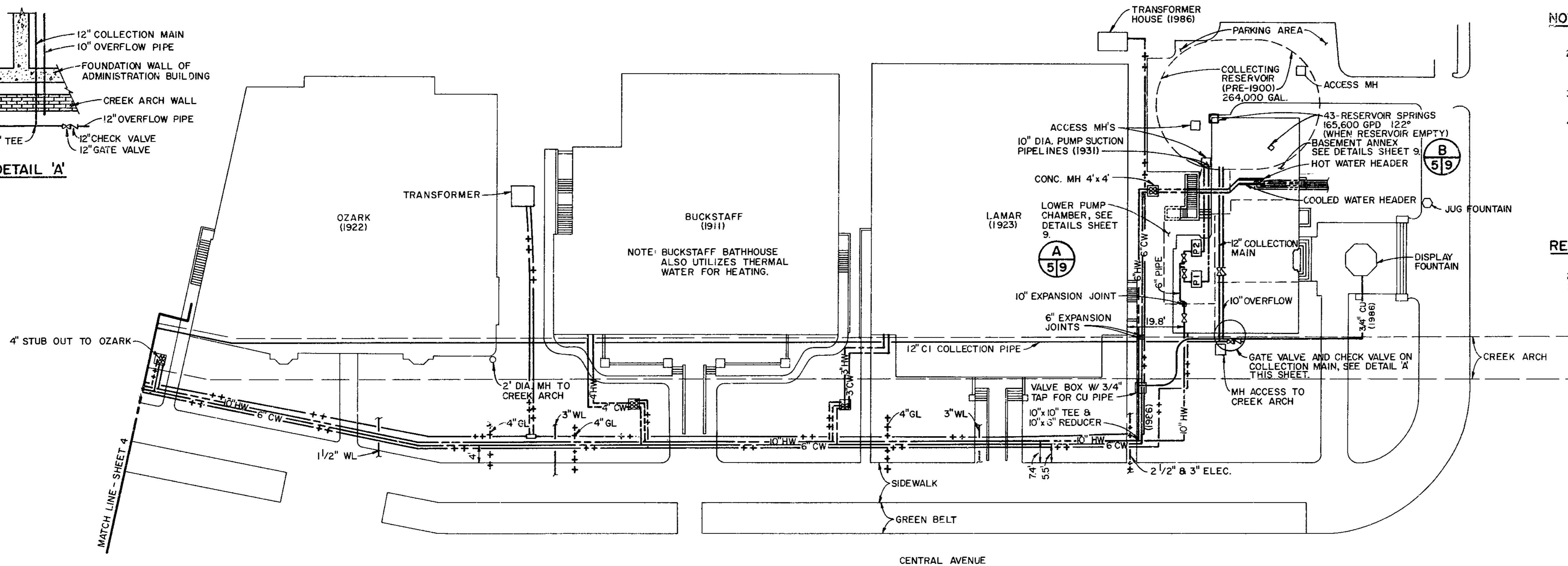


SEE DETAILS, SHEET 9 FOR TYPICAL BATHHOUSE CONNECTIONS.

DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET BATHHOUSE ROW PLAN & PROFILE	DRAWING NO. 128 41,035
DRAWN: MONEIMES			PKG. NO. SHEET 4
TECH. REVIEW:			OF 12
DATE: 4/1988			

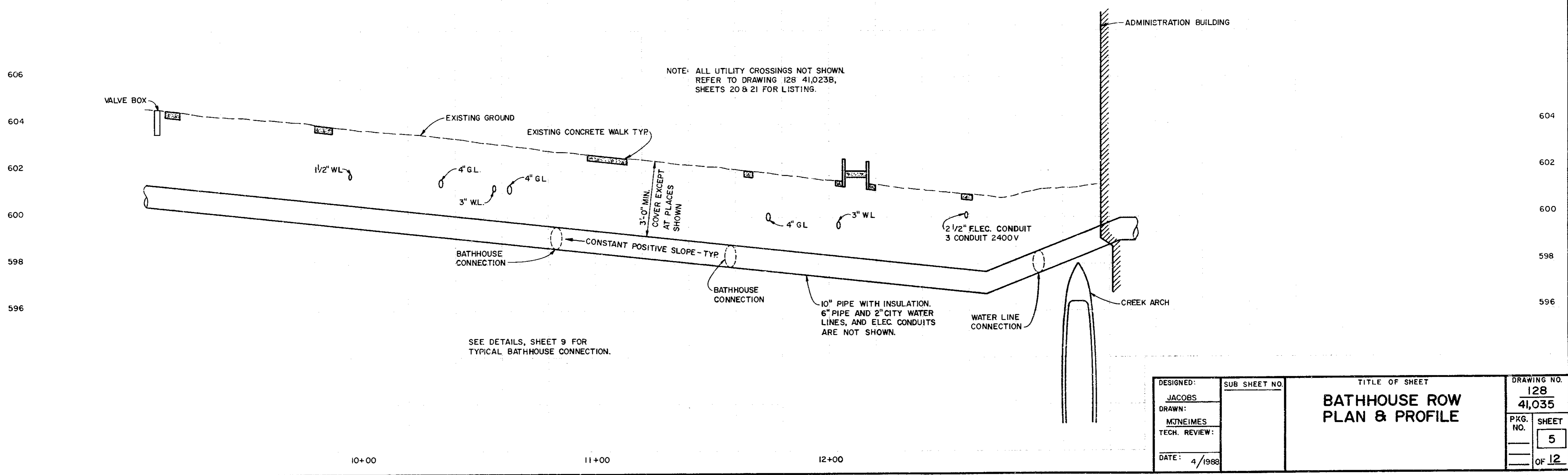
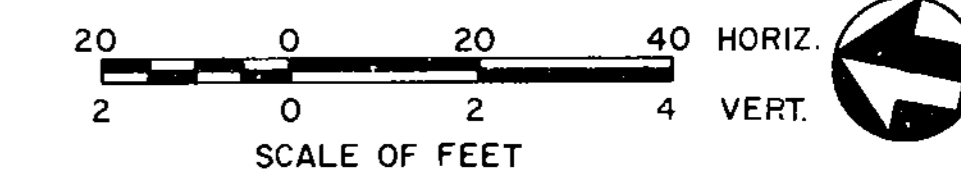


DETAIL 'A'

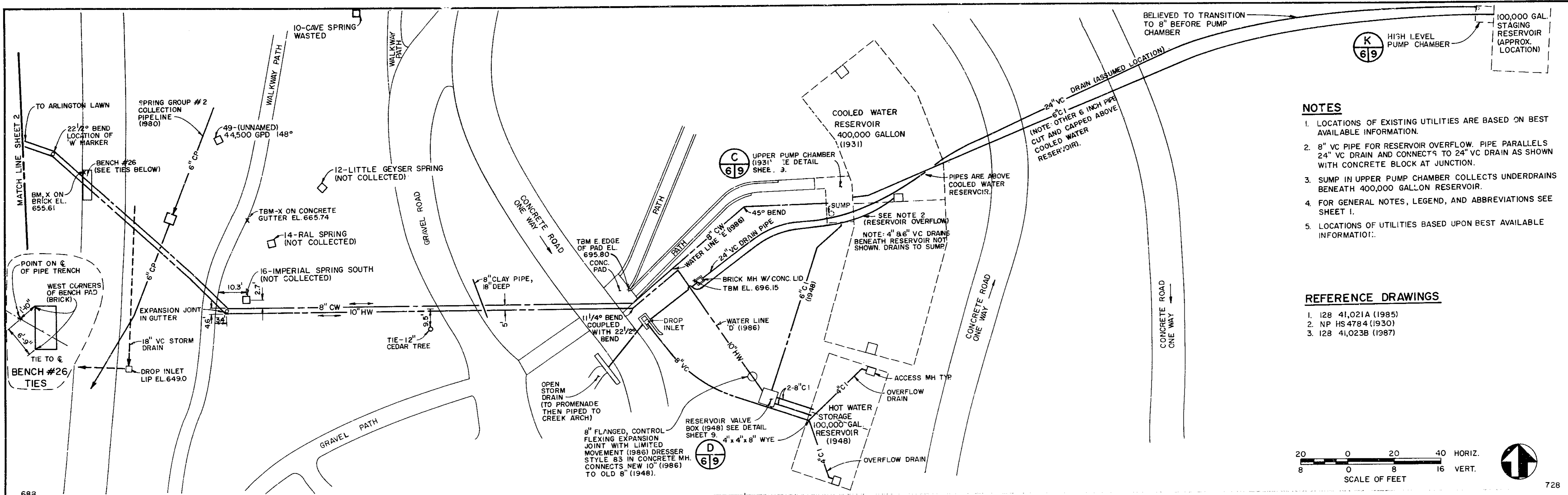


- NOTES**
1. PLUGGED AND/OR ABANDONED PIPE NOT SHOWN.
 2. FOR CLARITY, ALL VALVES AND METERS NOT SHOWN FOR VALVING AND METERING DETAILS, REFER TO SHEETS 10 AND 11.
 3. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS SEE SHEET 1.
 4. LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.

- REFERENCE DRAWINGS**
1. 128 41,021A (1985)
 2. 128 41,023B (1987)
 3. 128 41,031A (1987)

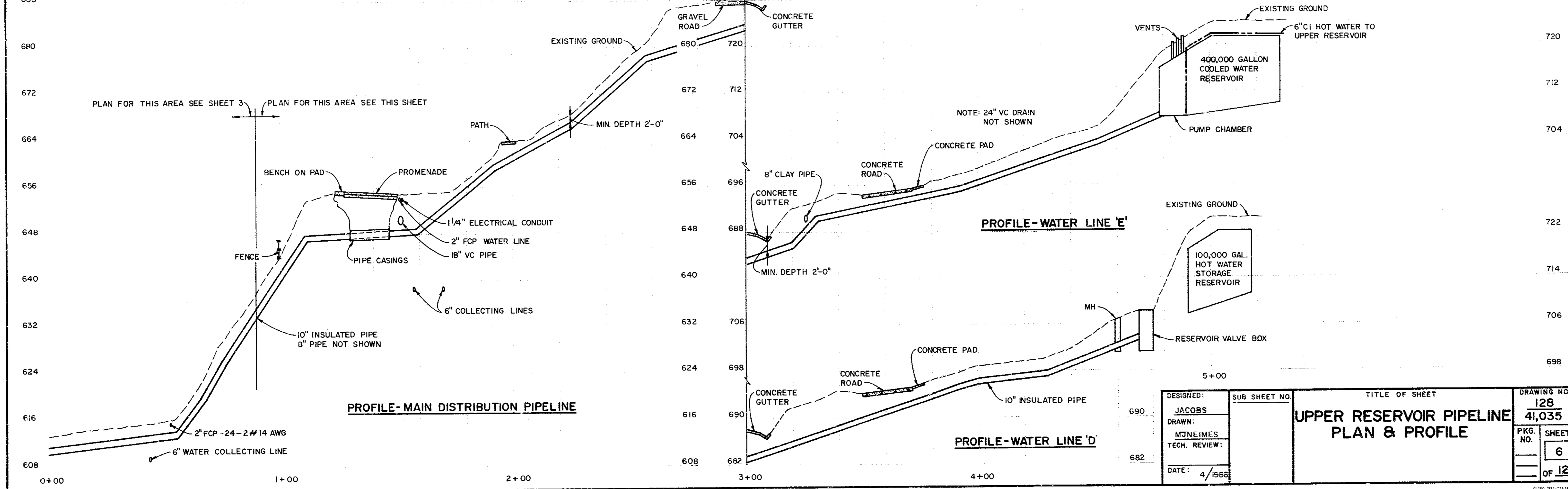
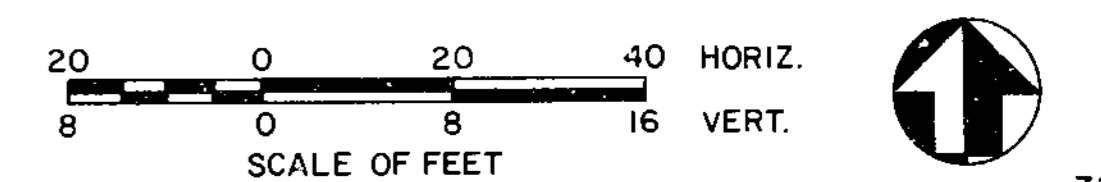


DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET BATHHOUSE ROW PLAN & PROFILE	DRAWING NO. 128 41,035
DRAWN: MCNEIMES			PKG. NO.
TECH. REVIEW:			SHEET 5
DATE: 4/1988			OF 12



- NOTES**
- LOCATIONS OF EXISTING UTILITIES ARE BASED ON BEST AVAILABLE INFORMATION.
 - 8" VC PIPE FOR RESERVOIR OVERFLOW. PIPE PARALLELS 24" VC DRAIN AND CONNECTS TO 24" VC DRAIN AS SHOWN WITH CONCRETE BLOCK AT JUNCTION.
 - SUMP IN UPPER PUMP CHAMBER COLLECTS UNDERDRAINS BENEATH 400,000 GALLON RESERVOIR.
 - FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS SEE SHEET 1.
 - LOCATIONS OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.

- REFERENCE DRAWINGS**
- 128 41,021A (1985)
 - NP HS 478.4 (1930)
 - 128 41,023B (1987)



DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET UPPER RESERVOIR PIPELINE PLAN & PROFILE	DRAWING NO. 128 41,035
DRAWN: MCNEIMES			PKG. NO.
TECH. REVIEW:			SHEET 6
DATE: 4/1985			OF 12

NOTES

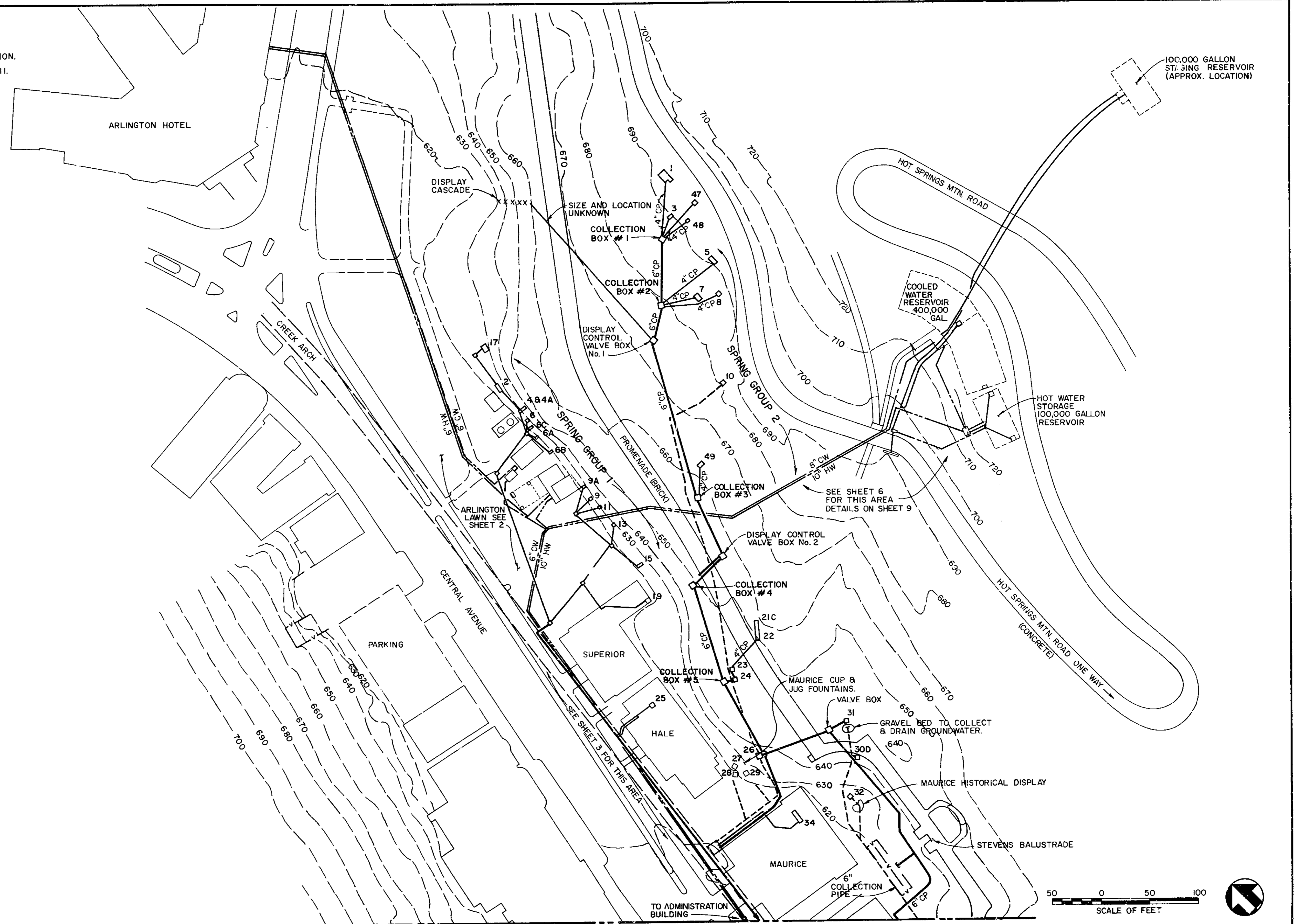
1. LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.
2. FOR VALVING AND METERING DETAILS, REFER TO SHEETS 10 AND 11.
3. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS, SEE SHEET 1.
4. SPRING GROUP 2 CONSTRUCTED 1980. SPRING GROUP 1 DETAILS GIVEN ON PREVIOUS SHEETS.
5. ABANDONED AND/OR PLUGGED LINES NOT SHOWN.
6. TOPOGRAPHY FROM DRAWINGS 128 41,021A (1985).

REFERENCE DRAWINGS

1. 128 41,015 A (1978)
2. 128 41,021A (1985)
3. 128 41,023 B (1987)
4. 128 60,001 (1981)

SPRING GROUP 2 INFORMATION

SPRING No.	SPRING NAME	FLOW (GPD)	TEMP (°F)
1	EGG SPRING	33,100	138°
3	ARLINGTON SPRING	28,800	140°
5	AVENUE SPRING	10,200	141°
7	IMPERIAL SPRING NORTH	3,300	139°
8	CRYSTAL SPRING	9,400	129°
10	CAVE SPRING		
21C	ALUM SPRING	900	
22	SUPERIOR SPRING SOUTH	2,900	
23	TWIN SPRING NORTH	1,400	145°
24	TWIN SPRING SOUTH	3,300	147°
26	PALACE SPRING	11,500	146°
30	ARCH SPRING		
31	HAYWOOD SPRING	21,000	136°
32	JOHN W. NOBLE SPRING		
47		28,300	148°
48		24,000	144°
49		44,500	148°



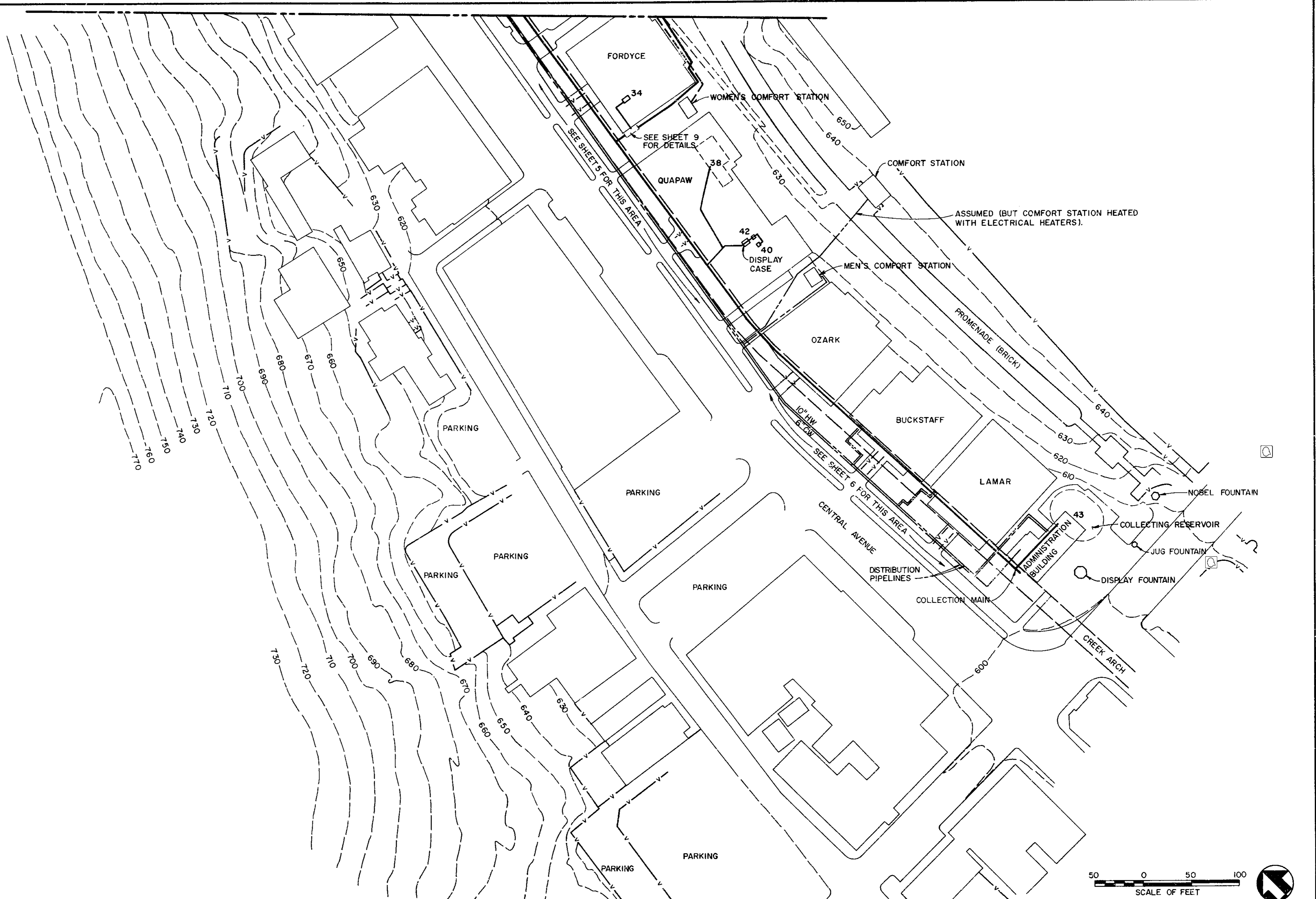
DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET SPRING COLLECTION GROUP #2 (NORTH HALF)	DRAWING NO. 128 41,035
DRAWN: MONEIMES			PKG. NO. SHEET
TECH. REVIEW:			7
DATE: 4/1988			OF 12

NOTES

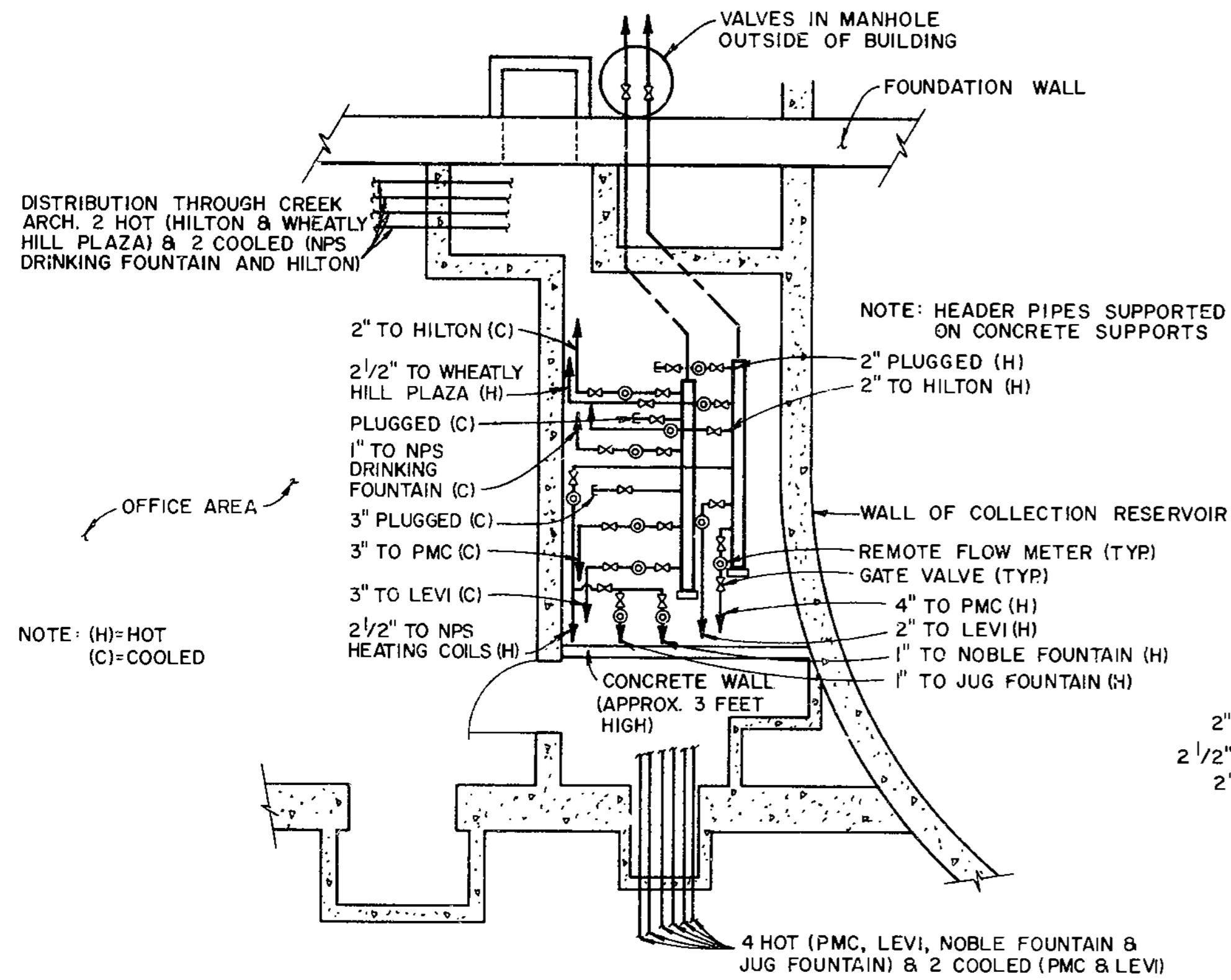
1. LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.
2. FOR VALVING AND METERING DETAILS, REFER TO SHEETS IC AND 11.
3. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS, SEE SHEET I.
4. SPRINGS THIS SHEET CONSTRUCTED 1981.
5. ABANDONED AND/OR PLUGGED LINES NOT SHOWN.
6. TOPOGRAPHY FROM DRAWINGS I28 41,021 A (1985).
7. FOR SPRING INFORMATION, SEE SHEET 7.

REFERENCE DRAWINGS

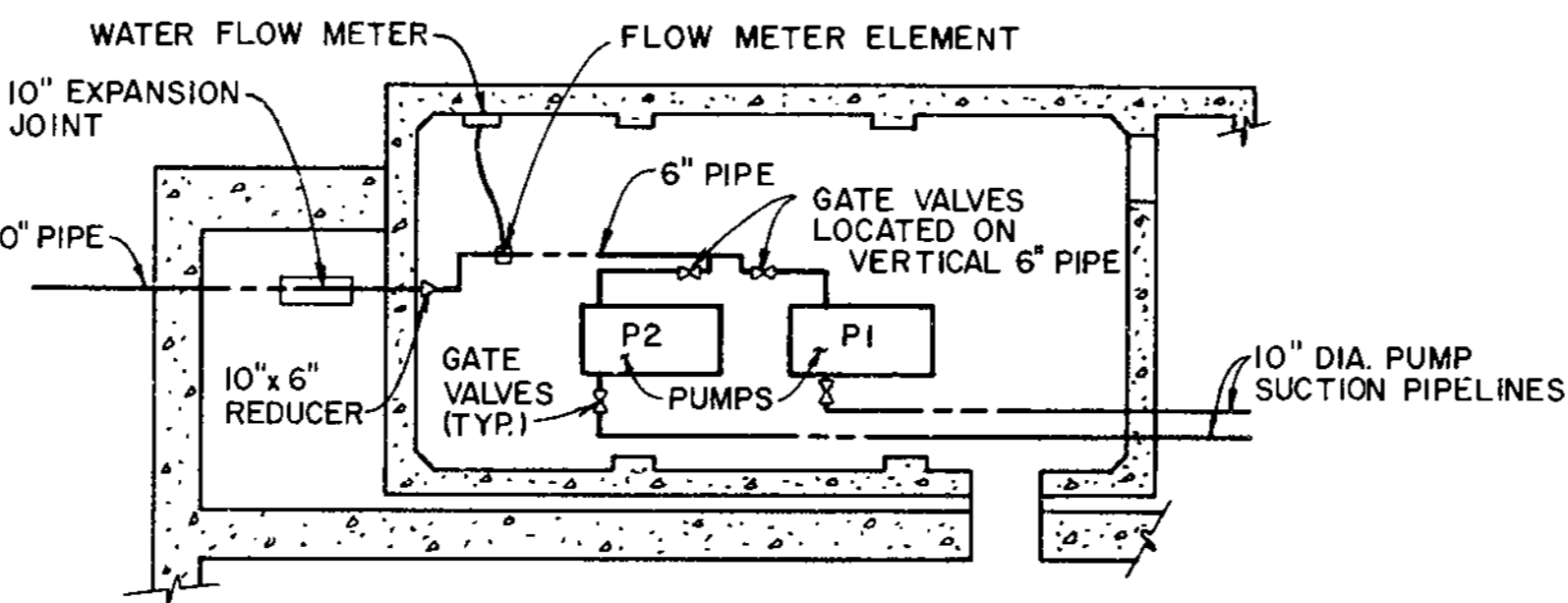
1. I28 41,015 A (1978)
2. I28 41,021 A (1985)
3. I28 41,023 B (1987)
4. I28 60,001 (1981)



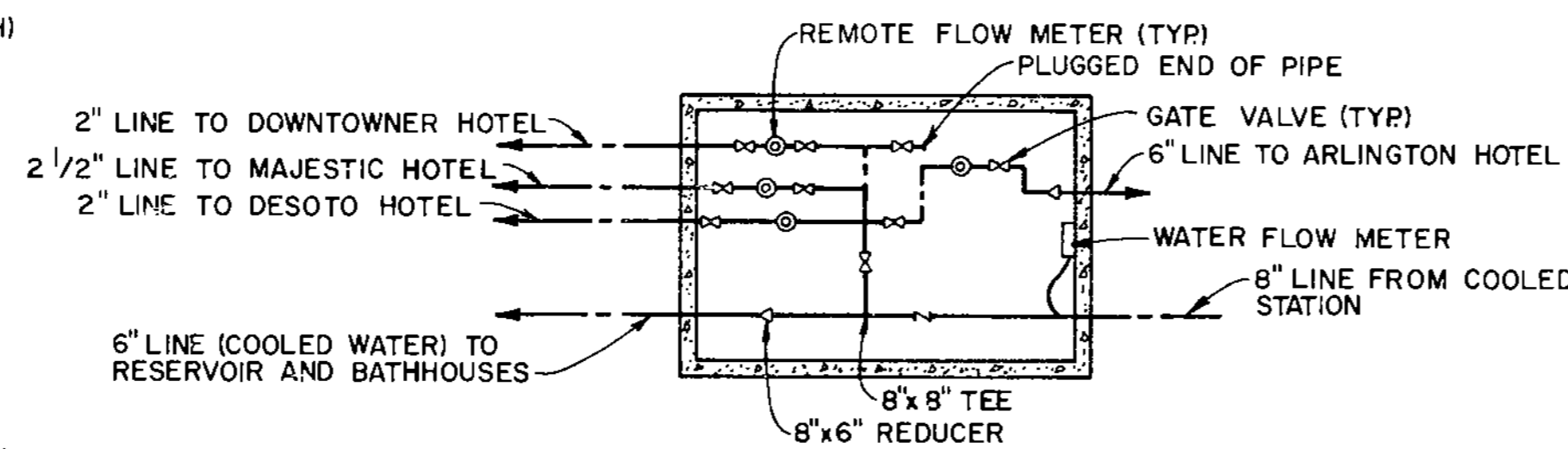
DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET SPRING COLLECTION GROUP #2 (SOUTH HALF)	DRAWING NO. i28 41,035
DRAWN: MJNEIMES			PKG. NO.
TECH. REVIEW:			SHEET 8
DATE: 4/1988			OF 12



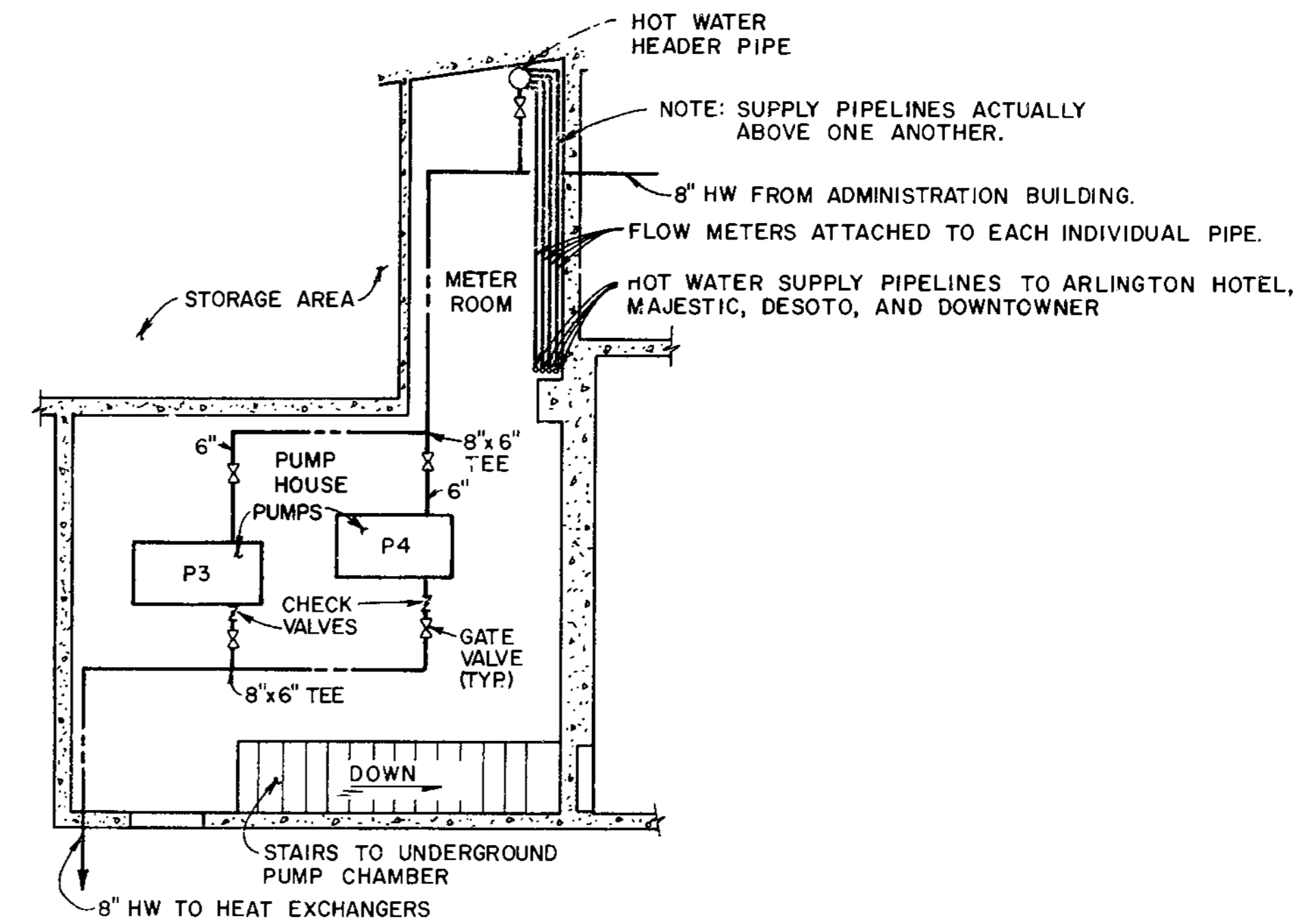
B BASEMENT ANNEX
SCALE: 1"=5'
5/9



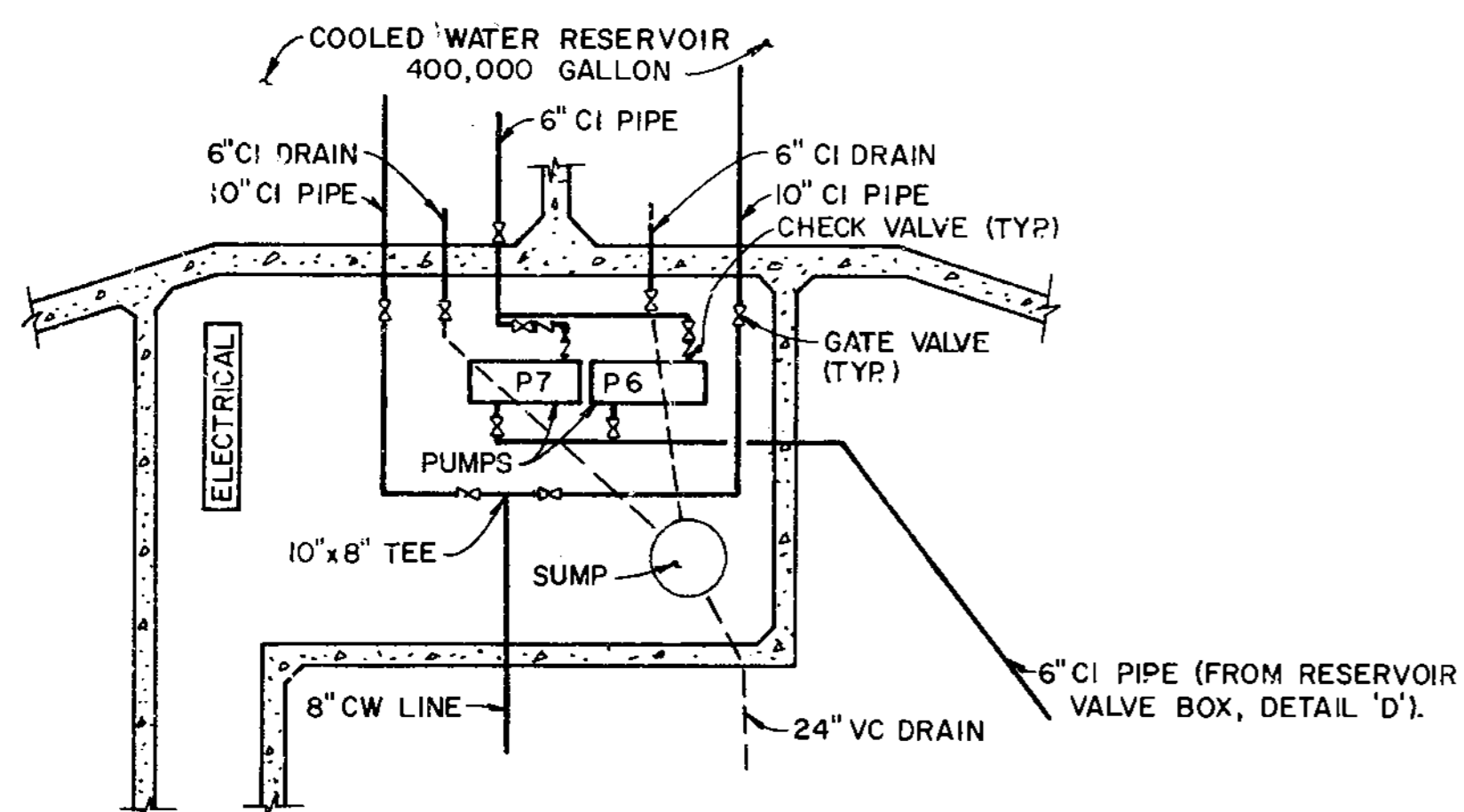
A LOWER PUMP CHAMBER
SCALE: 1"=8'
5/9



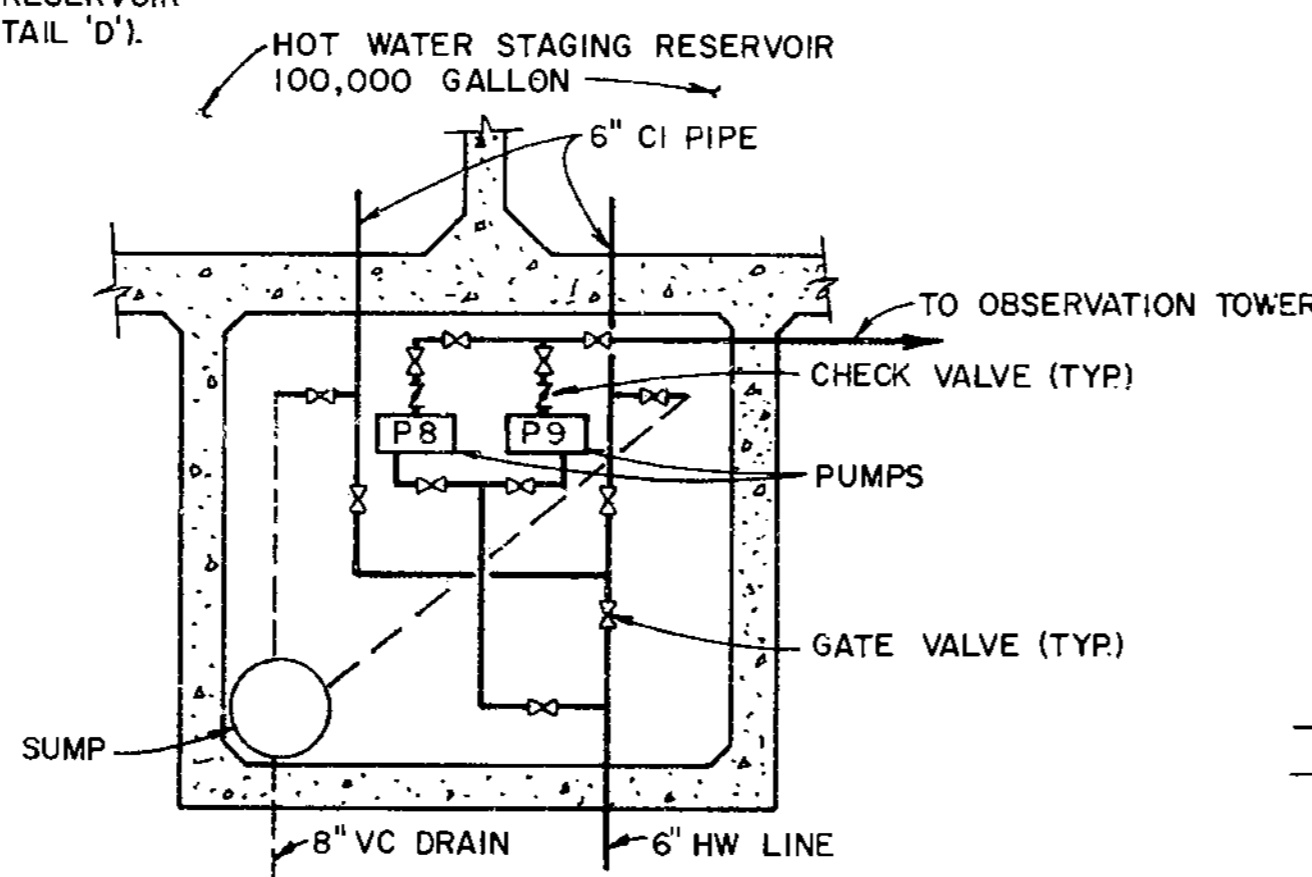
E COOLED WATER VALVE CHAMBER
SCALE: 1"=5'
2/9



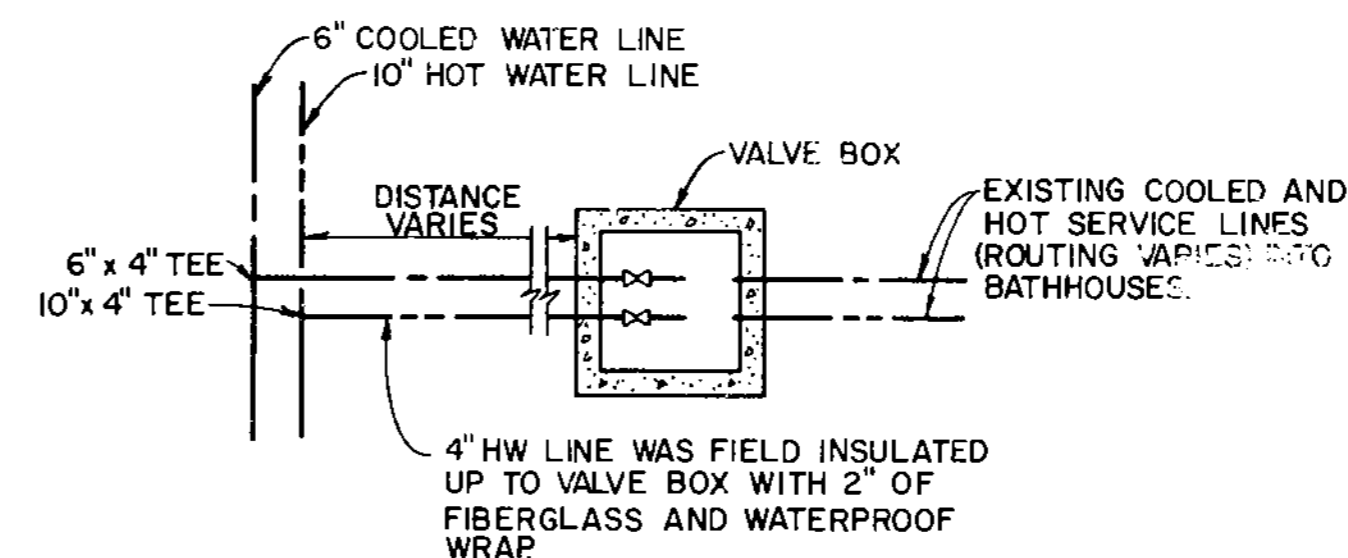
F PUMP HOUSE AND METER ROOM
SCALE: 1"=5'
2/9



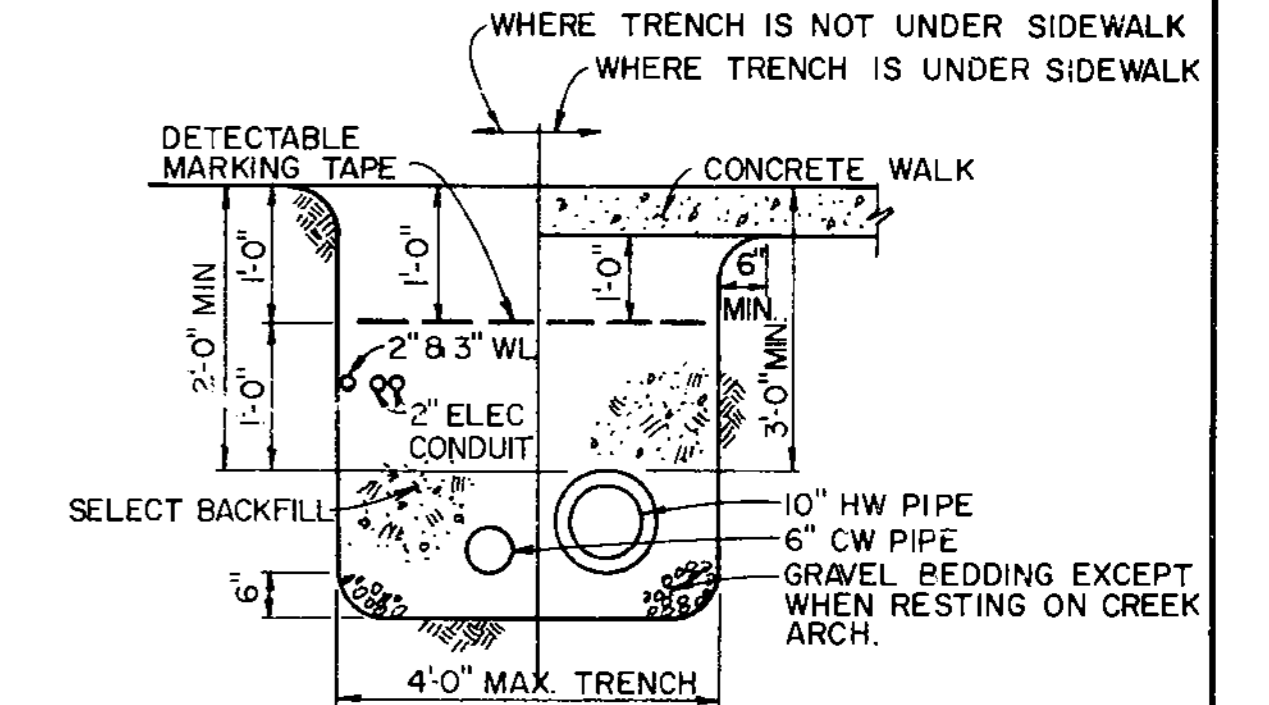
C UPPER PUMP CHAMBER
SCALE: 1"=5'
6/9



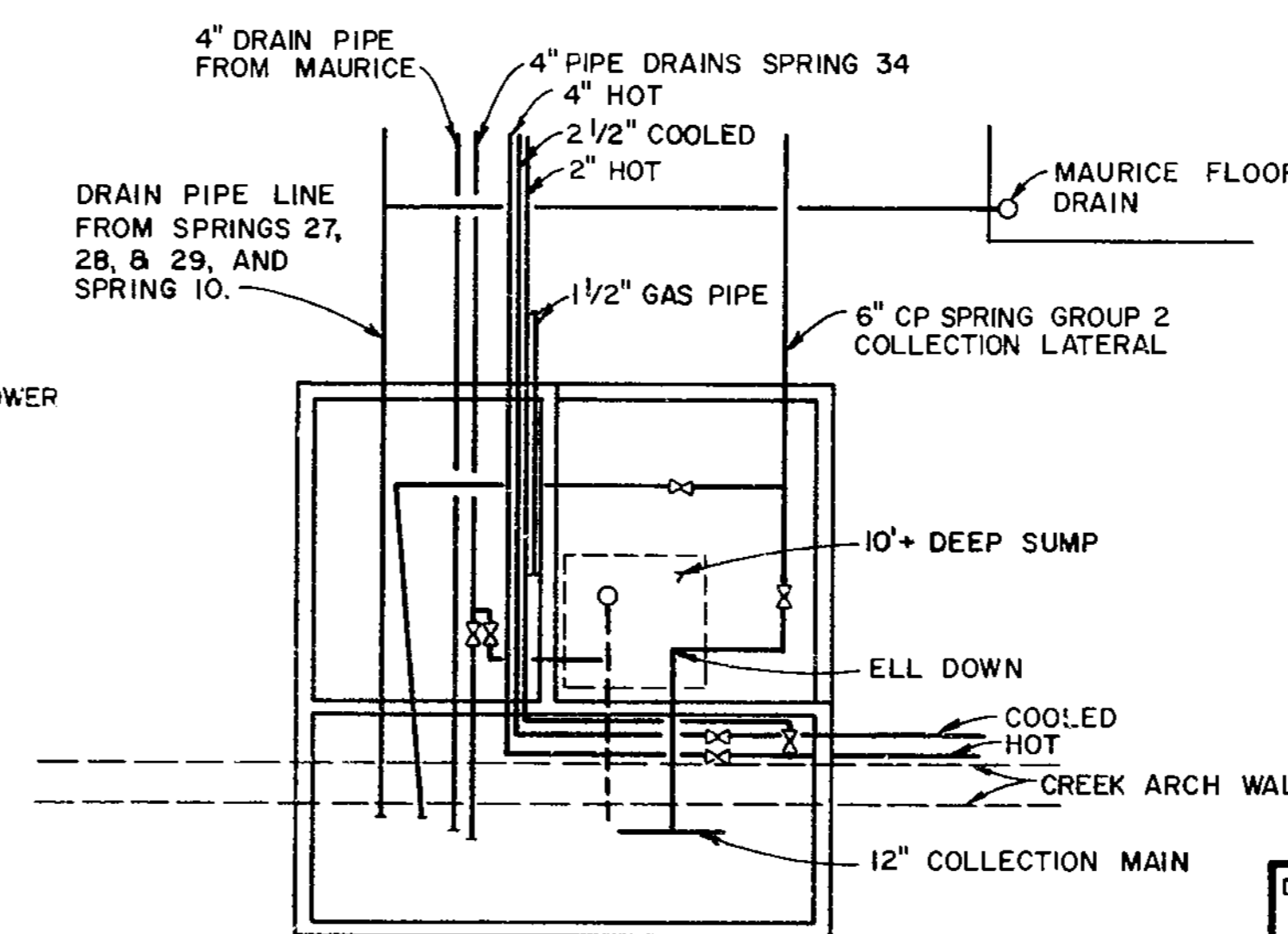
K HIGH LEVEL PUMP CHAMBER
NOT TO SCALE
6/9



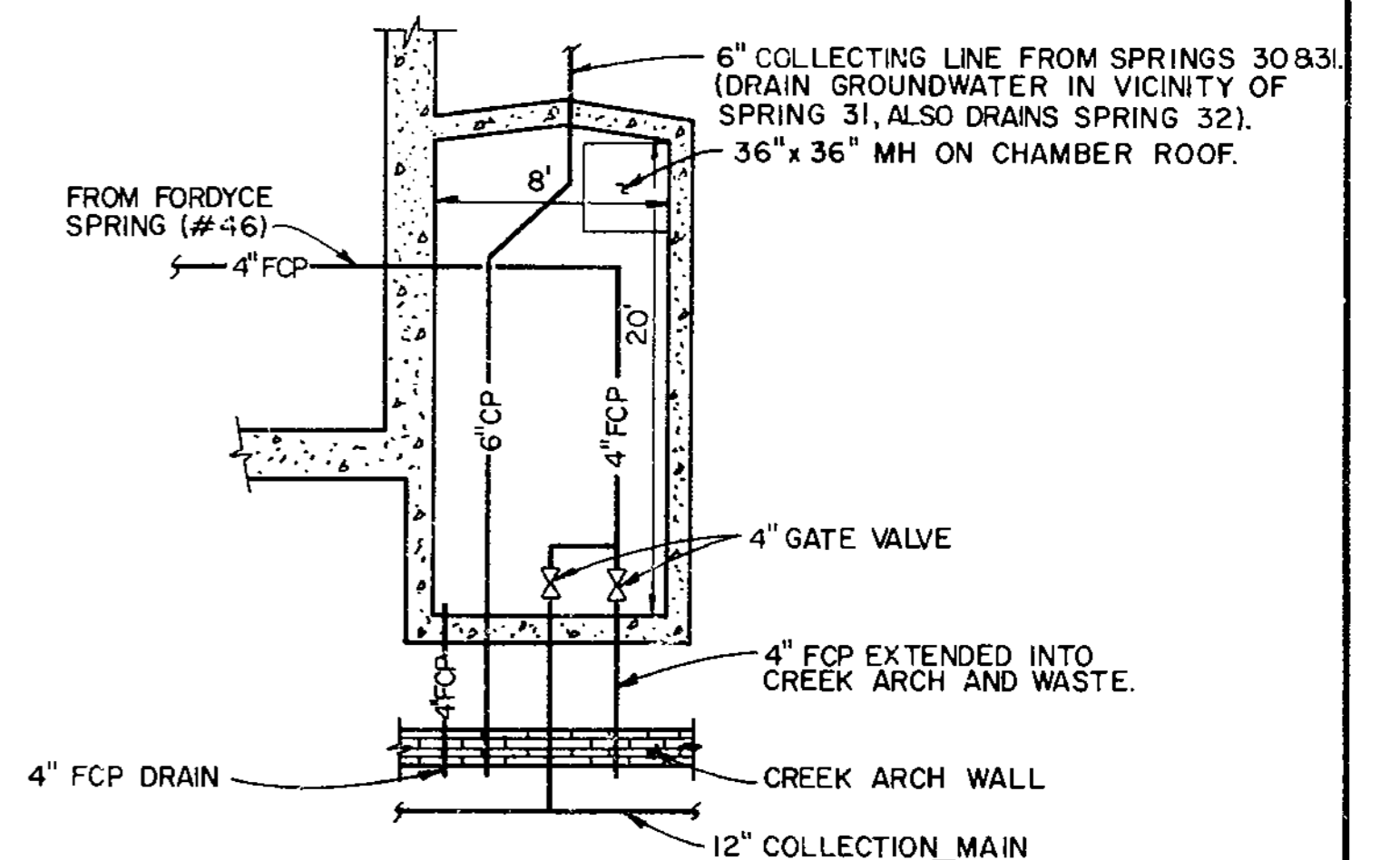
G BATHHOUSE CONNECTION
SCALE: 1"=4'
3/9



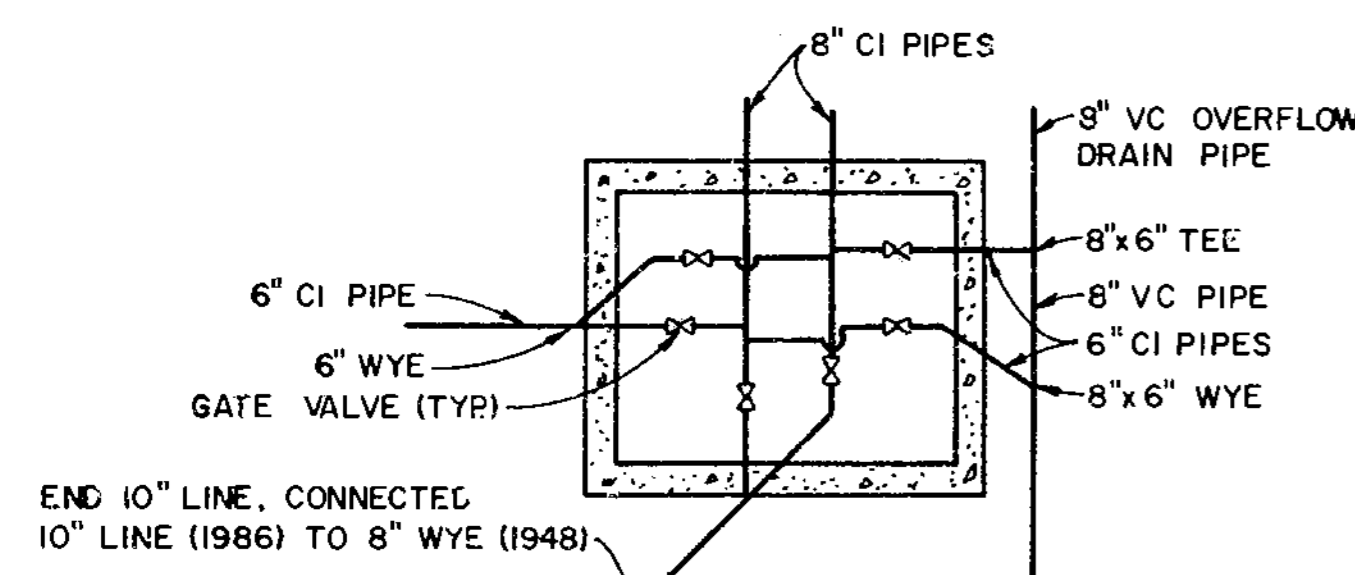
H TRENCH SECTION
NOT TO SCALE
3/9



I MAURICE VALVE PIT
NOT TO SCALE
4/9



J FORDYCE VALVE CHAMBER
NOT TO SCALE
4/9

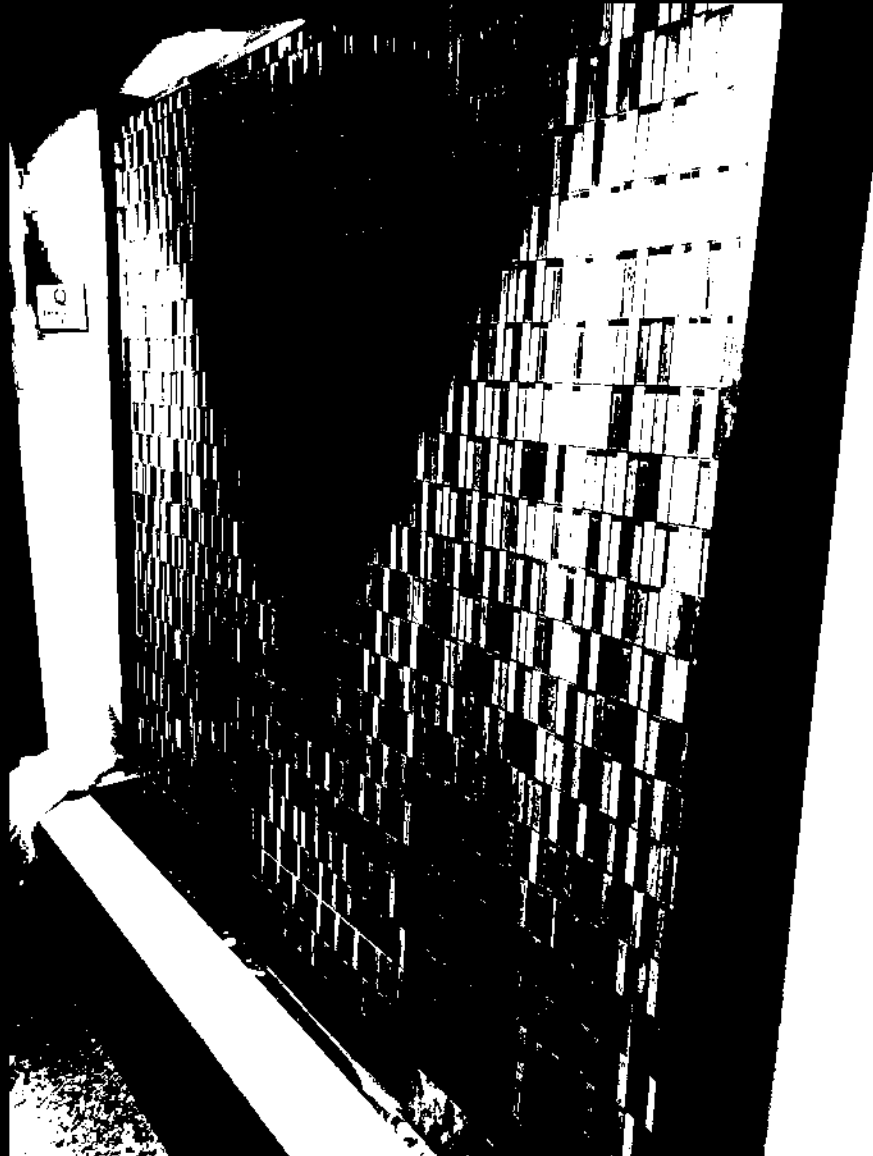


D RESERVOIR VALVE BOX
NOT TO SCALE
6/9

DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET DETAILS	DRAWING NO. 128
DRAWN: MJEIMES			41,035
TECH. REVIEW:			PKG. NO.
DATE: 4/1988			SHEET 9
			OF 12



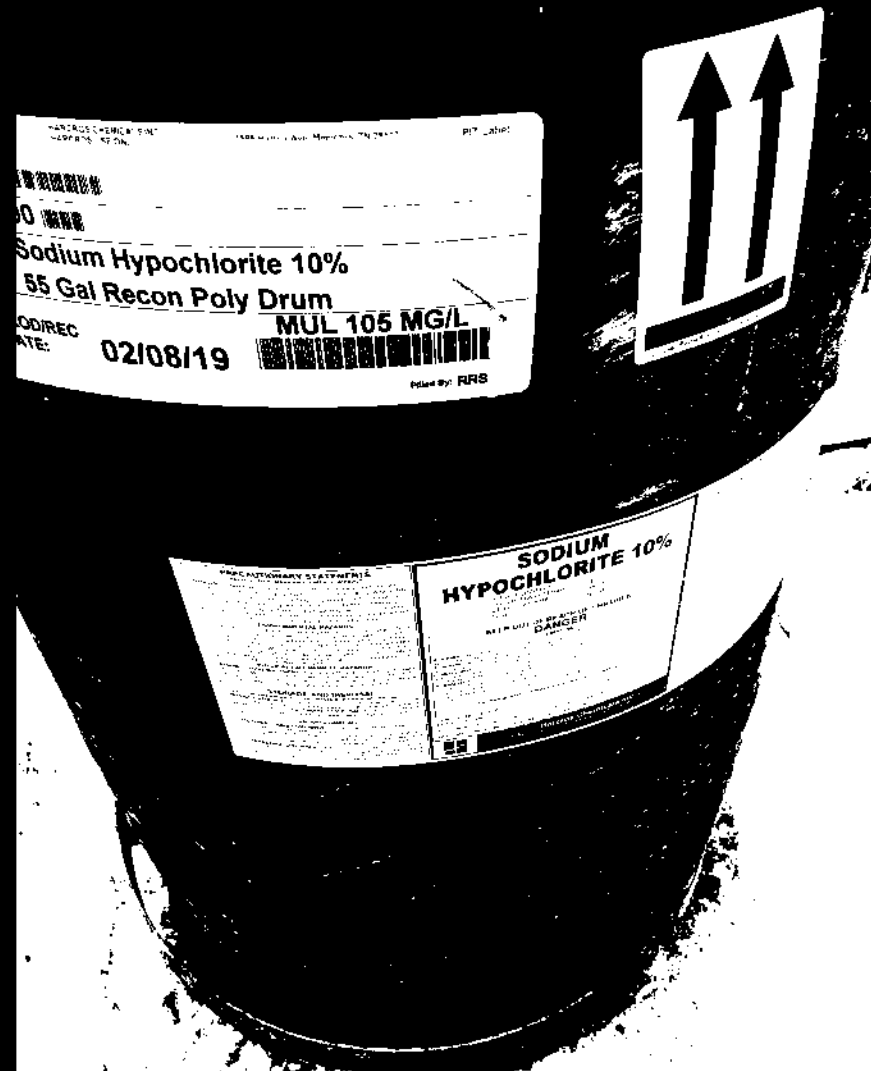
Display Fountain



Quapaw Basement Fountain



Quapaw basement hot tubs



Quapaw pool disinfectant

Month

AT
Water
(Record Eve

Operator

Sid & Co.

Date	Residual Chlorine/Bromine PPM				pH					Chlorine 1x/Week Combined	Acid	
	Opening	4 hrs later	4 hrs later	4 hrs later	4 hrs later	Opening	4 hrs later	4 hrs later	4 hrs later			4 hrs later
SLK 3/20	2.00	2.0	2.0	1.5	2.0							
SLK 3/20	11:00	2.0	2.0	2.0	2.0							
SLK 3/20	3:00	2.0	2.0	2.0	2.0							
SLK 3/21	7:00	2.0	2.0	2.0	2.0							
SLK 3/21	11:00	2.0	2.0	2.0	2.0							
MS 3/22	7:00	2.0	2.0	2.0	2.0							
MS 3/22	11:00	2.0	2.0	2.0	2.0							
MS 3/22	3:00	2.0	2.0	2.0	2.0							
SLK 3/23	7:00	2.0	1.5	2.0	2.0							
VMS 3/23	11:00	2.0	2.0	2.0	2.0							
MV 3-24	7:00	2.0	2.0	2.0	2.0							
MV 3-24	2:00	2.0	2.0	2.0	2.0							
MS 3-25	9:00	2.0	2.0	2.0	2.0							
SLK 3-25	11:00	2.0	2.0	2.0	2.0							
SLK 3-25	3:00	2.0	2.0	2.0	2.0							
SLK 3-25												

Quapaw residual testing-asked them to get a new kit for Sid



Two Fountains Near Maurice

From: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Sent: 24 Oct 2019 14:01:55 +0000
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Lucas, Claressa (CDC/DDID/NCIRD/DBD)
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Subject: FW: [EXTERNAL] Study of Legionella and CI Contact Time
Attachments: HOSP_Uilities Drawings text.pdf, Legionella Testing Plan 10-23-19.xlsx, Susceptibility of LP to CI in Tap Water.pdf

Claressa-calling you shortly on this email.

Jasen

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, October 23, 2019 11:23 PM
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Said, Maria <maria_said@nps.gov>; Mark Scott <Mark_Scott@nps.gov>; Terry.Paul@arkansas.gov; Richard.McMullen@arkansas.gov
Cc: Miller, Laura <laura_a_miller@nps.gov>; Sara Newman <sara_newman@nps.gov>
Subject: Re: [EXTERNAL] Study of Legionella and CI Contact Time

Good Evening Everyone,

Thank you for the assistance today. It was great to talk about the need for additional testing at Hot Spring National Park. It was also good to share the plan to try to reduce water age were possible. The park plans to take a temperature at the top of the cooled water storage tank and at the bottom from the drain and share with everyone.

When time permits, can you please look at the attached legionella testing plan to help understand if the NPS water system has legionella present. I have attached a drawing to help everyone understand the system and locations.

Meanwhile, it would be great to agree upon an appropriate contact time for NaOH chemical disinfection for a residual between 2 and 4 mg/L. CDR Troy Ritter was great and shared the attached study on contact time; however, it is for a lower residual. Currently, we have recommended 20-30 minutes; however, facilities have stated that is problematic.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718

Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

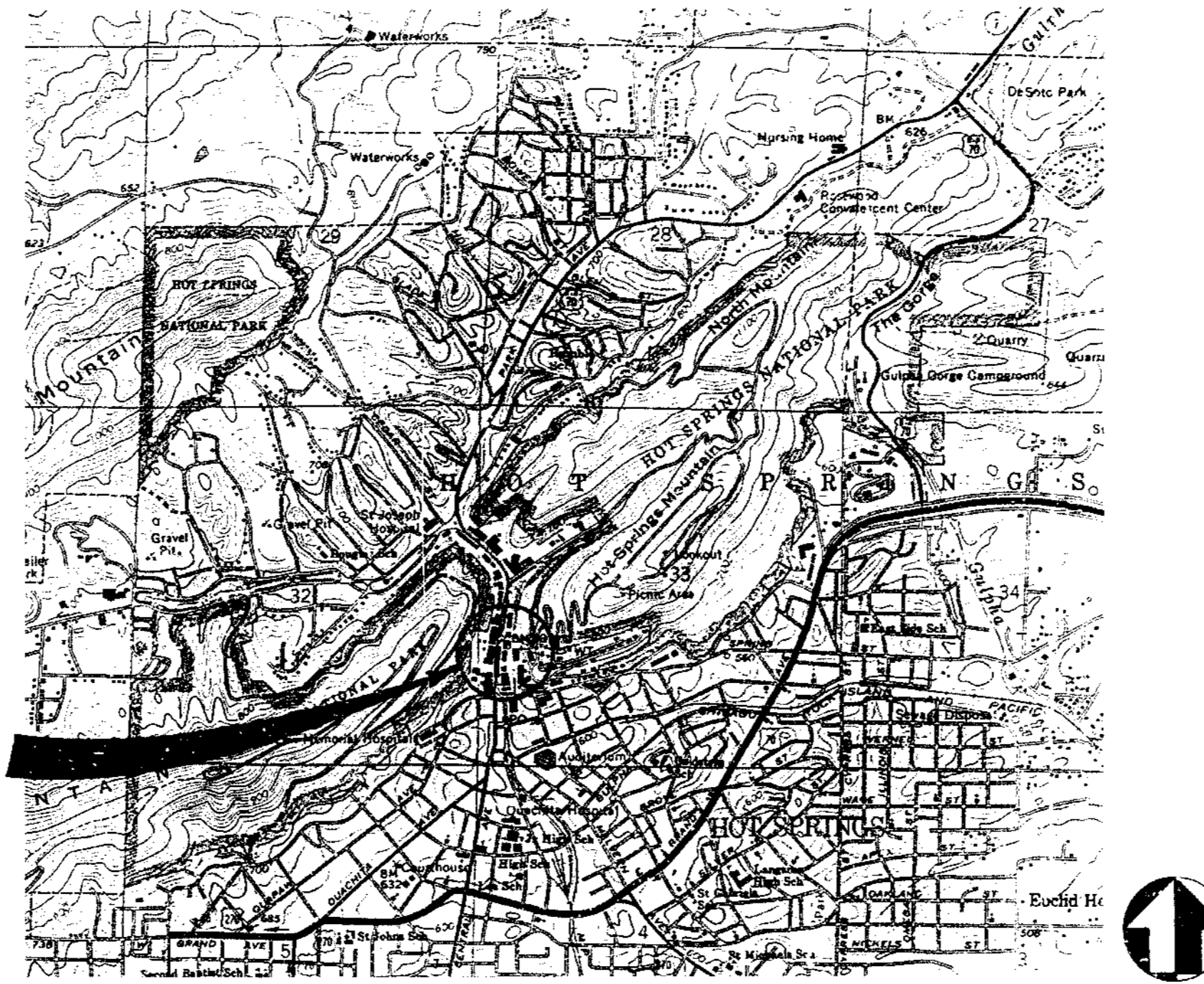
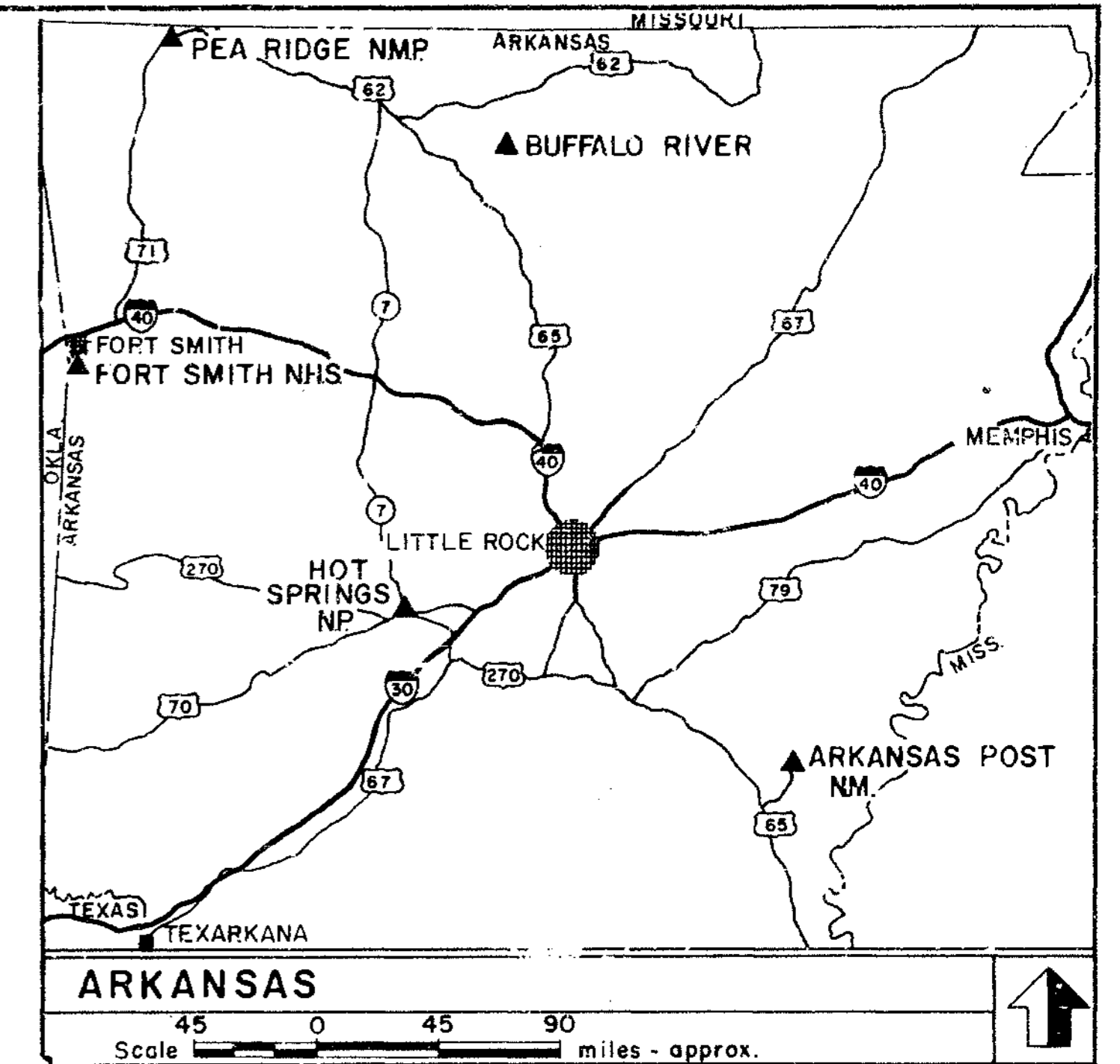
"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

Hot Springs National Park

Thermal Water Collection and Distribution System

GENERAL NOTES

1. LOCATIONS OF THE THERMAL WATER COLLECTION AND DISTRIBUTION SYSTEM AND APPURTENANCES WERE OBTAINED FROM SURFACE FIELD INSPECTIONS AND AS-BUILT DRAWINGS. NO SUB-SURFACE EXPLORATION WAS ATTEMPTED TO AVOID DISTURBANCES OF THE PARK.
2. SPRING FLOW RATES AND TEMPERATURES WERE MEASURED IN 1976 PRIOR TO CONSTRUCTION OF THE EXISTING COLLECTION SYSTEM.
3. ALL HW PIPE IS 6-INCH OR 10-INCH DIAMETER, 2-INCH FACTORY INSULATED (EXTERIOR), EPOXY LINED DUCTILE IRON PIPE CONVEYING HOT WATER.
4. ALL CW PIPE IS 6-INCH OR 8-INCH DIAMETER, EPOXY LINED, DUCTILE IRON PIPE CONVEYING COOLED WATER.
5. ALL CP PIPE IS 4-INCH, 6-INCH, OR 8-INCH DIAMETER CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPE CONVEYING HOT WATER. THE 4-INCH AND 6-INCH PIPE WAS INSTALLED INSIDE 6-INCH AND 8-INCH DIAMETER POLYVINYL CHLORIDE (PVC) PIPE, RESPECTIVELY.
6. ALL FCP PIPE IS 1/2-INCH, 2-INCH, 4-INCH, OR 6-INCH DIAMETER "SILVER THREAD" FIBERGLASS PIPE CONVEYING HOT WATER. THE 4-INCH AND 6-INCH PIPE WAS INSTALLED INSIDE 6-INCH OR 8-INCH DIAMETER ASBESTOS-CEMENT PIPE, RESPECTIVELY.
7. ALL TEMPERATURES SHOWN ARE DEGREES FAHRENHEIT.



VICINITY MAP
SCALE OF FEET

ABBREVIATIONS

- AC ASBESTOS CEMENT PIPE
- BM BENCHMARK
- CI CAST IRON PIPE
- CL CENTER LINE
- CONC CONCRETE
- CP COLLECTION PIPE
- CP COPPER PIPE
- CW COOLED WATER PIPE
- DIA DIAMETER
- EL ELEVATION
- ELEC ELECTRICAL
- FCP FIBERGLASS HOT WATER PIPE
- GAL GALLON
- GL GAS PIPELINE
- GPD GALLONS PER DAY
- GV GATE VALVE
- HW HOT WATER
- INCL INCLUDED
- MH MANHOLE
- PVC POLYVINYL CHLORIDE PIPE
- SS SANITARY SEWER
- STA STATION
- TBM TEMPORARY BENCHMARK
- VC VITRIFIED CLAY PIPE
- WL CITY WATER LINE

LEGEND

- | SYMBOL | DESCRIPTION |
|----------|-----------------------------|
| --- | HOT WATER PIPELINES |
| --- | COOLED WATER PIPELINES |
| ---++--- | ELECTRICAL CONDUIT |
| --- | SPRING COLLECTION PIPELINES |
| +++++ | GAS PIPELINES |
| ---v--- | VERTICAL WALL |

INDEX

1. COVER SHEET
2. ARLINGTON LAWN AREA
3. BATHHOUSE ROW - PLAN & PROFILE
4. BATHHOUSE ROW - PLAN & PROFILE
5. BATHHOUSE ROW - PLAN & PROFILE
6. UPPER RESERVOIR PIPELINE - PLAN & PROFILE
7. SPRING COLLECTION GROUP #2
8. SPRING COLLECTION GROUP #2
9. DETAILS
10. PROCESS AND INSTRUMENTATION DIAGRAMS
11. PROCESS AND INSTRUMENTATION DIAGRAMS
12. ONE LINE - ELECTRICAL

REFERENCE DRAWINGS

1. NP HS-4784 (1930)
2. NP HS-2043 (1948)
3. NP HS-5311C (1948)
4. 128 41,015A (1978)
5. 128 41,021A (1985)
6. 128 60,001 (1981)
7. 128 41,023B (1987)
8. 128 60,190 (1978)
9. 128 41,031A (1987)

REDUCED SIZE REPRODUCTION

Prepared by:

HYDRG-TRIAD, LTD.
1310 Wadsworth Blvd.
Suite 100
Lakewood, Colo. 80215

Mark	Sheet	REVISION	Date	Initial

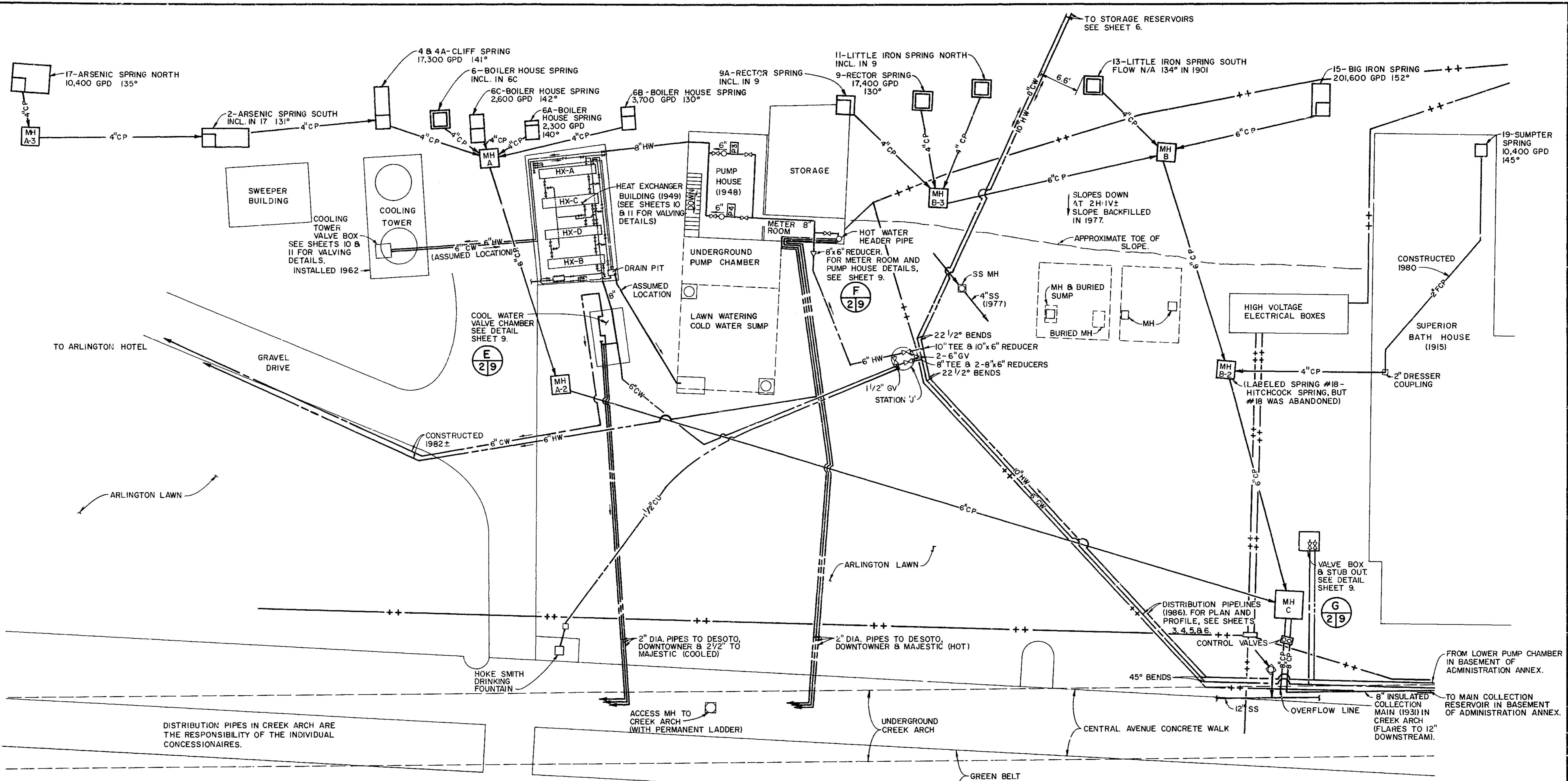
This drawing has been prepared in compliance with Preliminary/Comprehensive Design Drawing No. _____
Approved by _____ on _____
Title _____ Date _____
Assistant Manager _____ Date _____

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
DENVER SERVICE CENTER

DESIGNED: JACOBS
DRAWN: MJNEIMES
TECH. REVIEW: _____
DATE: 4/1988

TITLE OF SHEET
EXISTING CONDITIONS OF THE THERMAL WATER COLLECTION & DISTRIBUTION SYSTEM
LOCATION WITHIN PARK
BATHHOUSE ROW
NAME OF PARK
HOT SPRINGS NATIONAL PARK
SOUTHWEST REGION GARLAND COUNTY ARKANSAS STATE

DRAWING NO. 128
4,035
PKG. NO. 1
SHEET NO. 1
OF 12



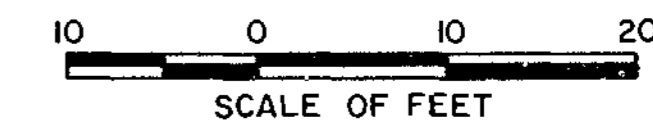
REFERENCE DRAWINGS

- 1. 128 41,015 A (1978)
- 2. 128 41,021 A (1985)
- 3. 128 60,001 (1981)
- 4. 128 41,023 B (1987)
- 5. 128 60,190 (1978)
- 6. NP HS-4784 (1930)
- 7. NP HS-5311C (1948)
- 8. NP HS-2043 (1948)
- 9. 128 41,031A (1987)

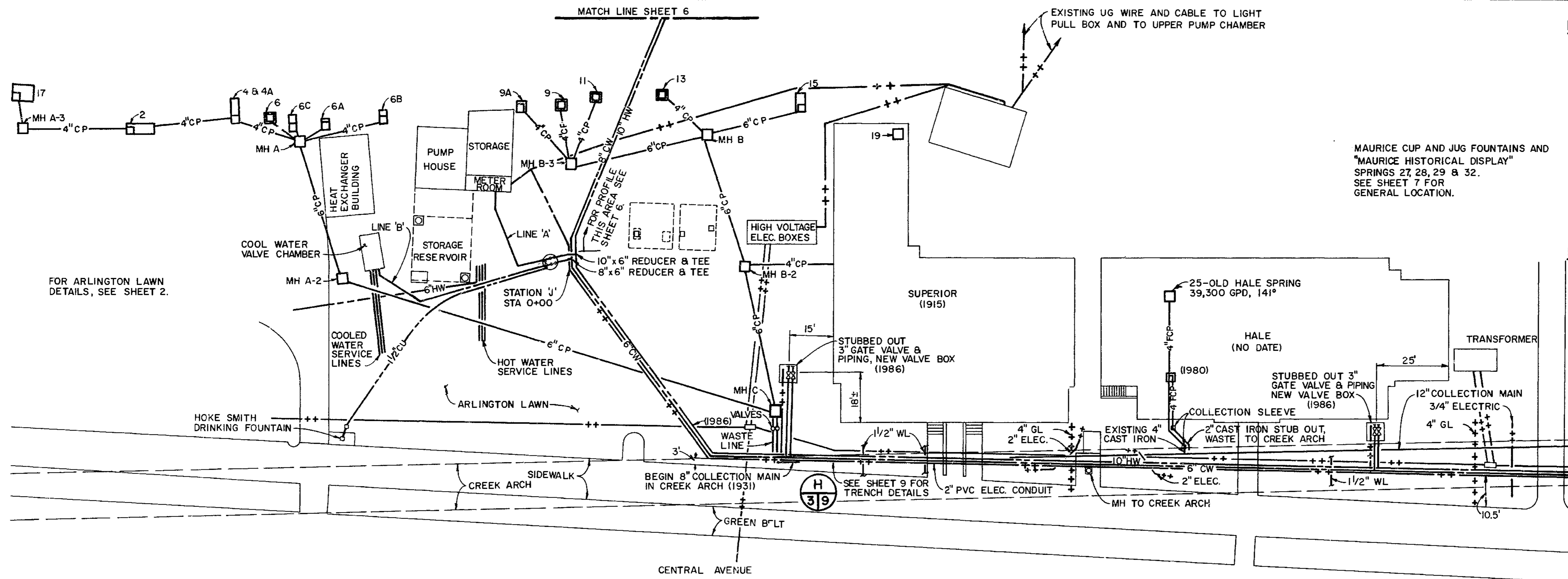
NOTES

- 1. SPRING BOXES AND COLLECTION PIPES THIS SHEET CONSTRUCTED 1977 EXCEPT AS NOTED.
- 2. DISTRIBUTION LINES CONSTRUCTED 1986.
- 3. ABANDONED OR PLUGGED LINES NOT SHOWN.

- 4. LAWN SPRINKLER SYSTEM NOT SHOWN, BUT CONSISTS OF GALVANIZED PIPE AND PLASTIC PIPE UNDER MOST OF ARLINGTON LAWN.
- 5. FOR LEGEND, GENERAL NOTES, AND ABBREVIATIONS, SEE SHEET 1.
- 6. LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.
- 7. VALVES, METERS, PUMPS, AND DISTRIBUTION PIPING ARE SHOWN ON THE PROCESS AND INSTRUMENTATION DIAGRAMS SHOWN ON SHEETS 10 AND 11.
- 8. ALL SPRINGS SHOWN ON THIS SHEET ARE COLLECTED.



DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET ARLINGTON LAWN AREA THERMAL WATER DISTRIBUTION SYSTEM AND SPRING GROUP #1 COLLECTION SYSTEM	DRAWING NO. 128 41,035
DRAWN: MJEIMES			PKG. NO.
TECH. REVIEW:			SHEET 2
DATE: 4/1988			OF 12

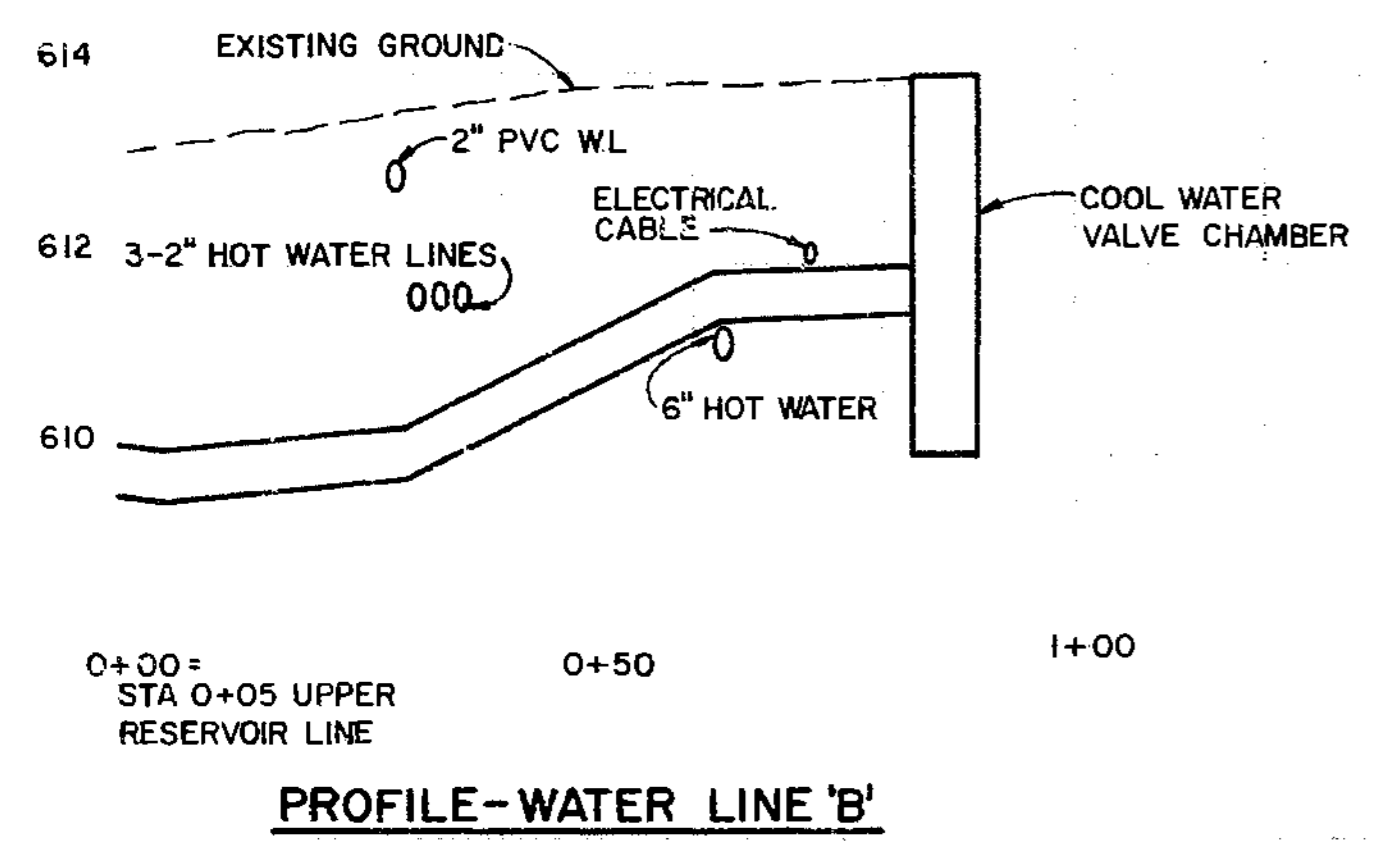
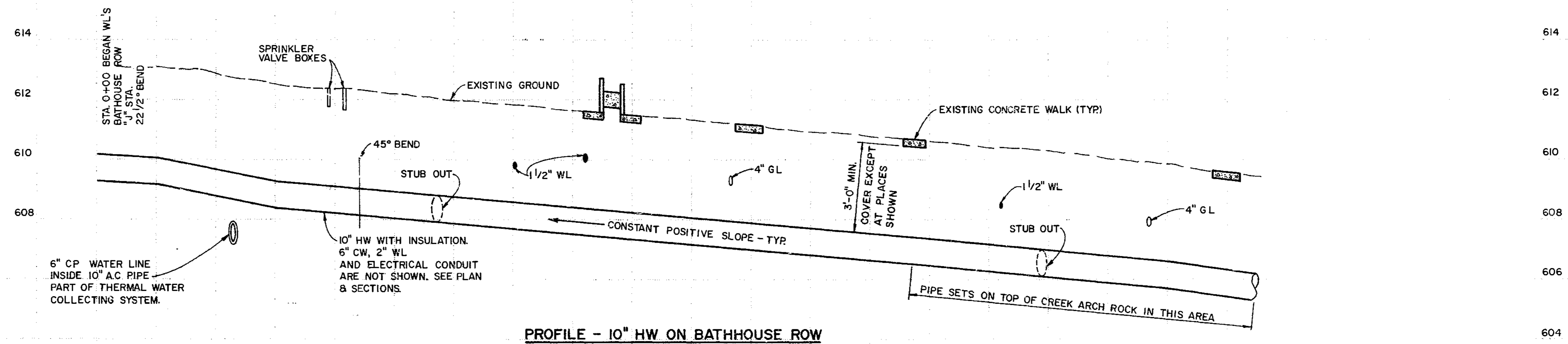
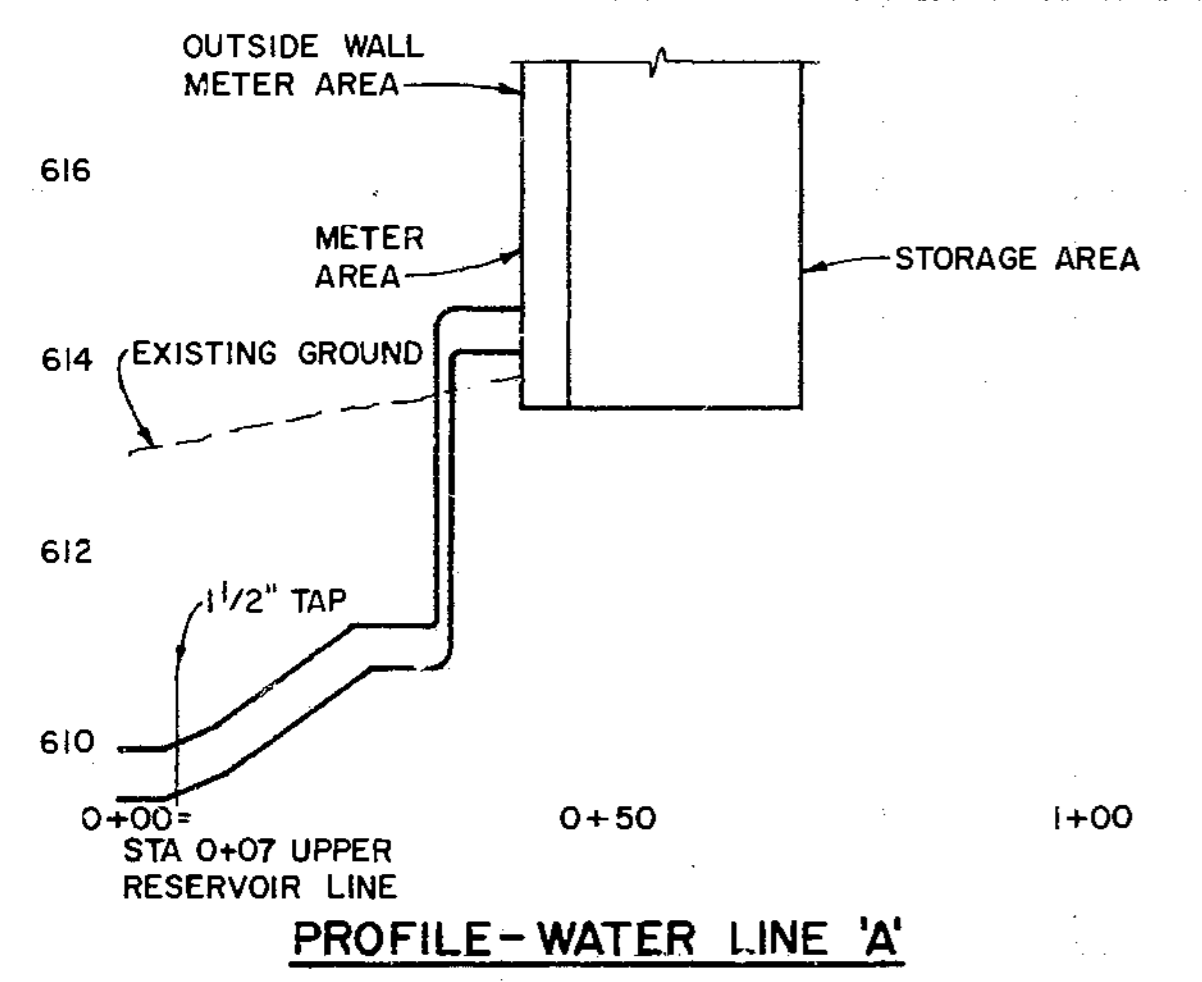
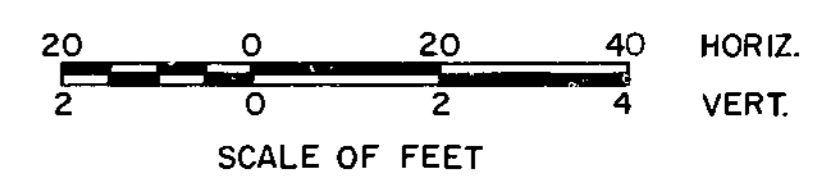


MAURICE CUP AND JUG FOUNTAINS AND "MAURICE HISTORICAL DISPLAY" SPRINGS 27, 28, 29 & 32. SEE SHEET 7 FOR GENERAL LOCATION.

- NOTES**
- FOR LEGEND, GENERAL NOTES, AND ABBREVIATIONS, SEE SHEET 1.
 - SPRING INFORMATION AND ADDITIONAL PIPING DETAILS SHOWN ON SHEET 2.
 - LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.
 - PLUGGED AND/OR ABANDONED PIPE NOT SHOWN.
 - FOR CLARITY, ALL VALVES AND METERS NOT SHOWN. FOR VALVING AND METERING DETAILS, REFER TO SHEETS 10 AND 11.

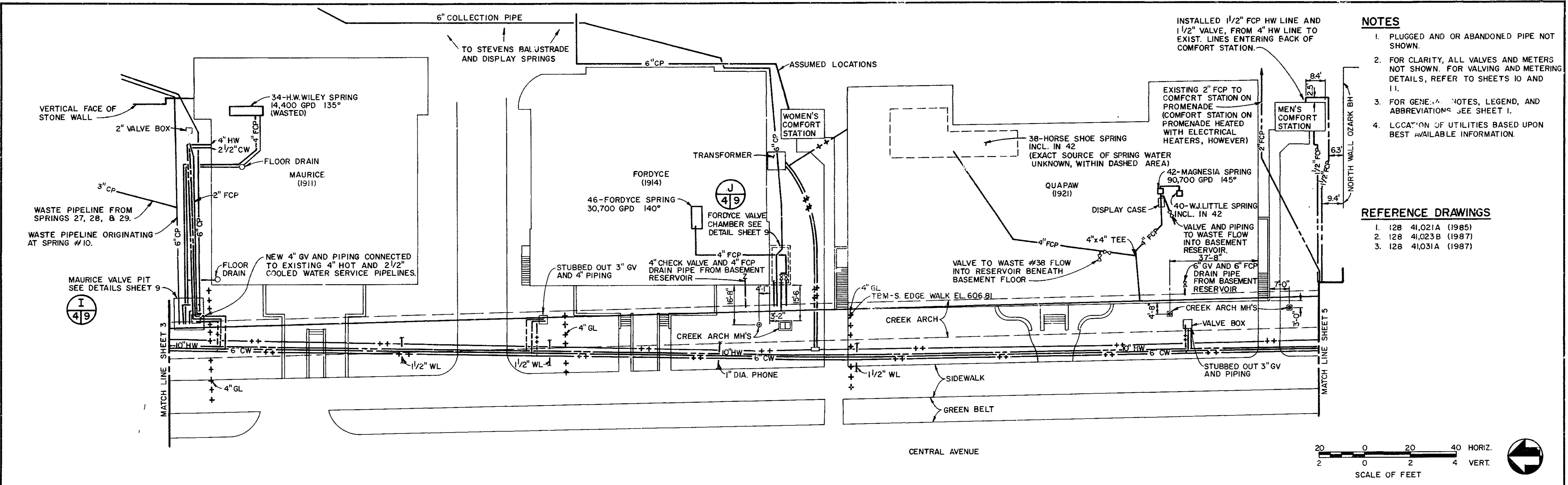
REFERENCE DRAWINGS

- 128 41,015A (1978)
- 128 41,021A (1985)
- 128 60,001 (1981)
- 128 41,023B (1987)
- 128 41,031A (1987)



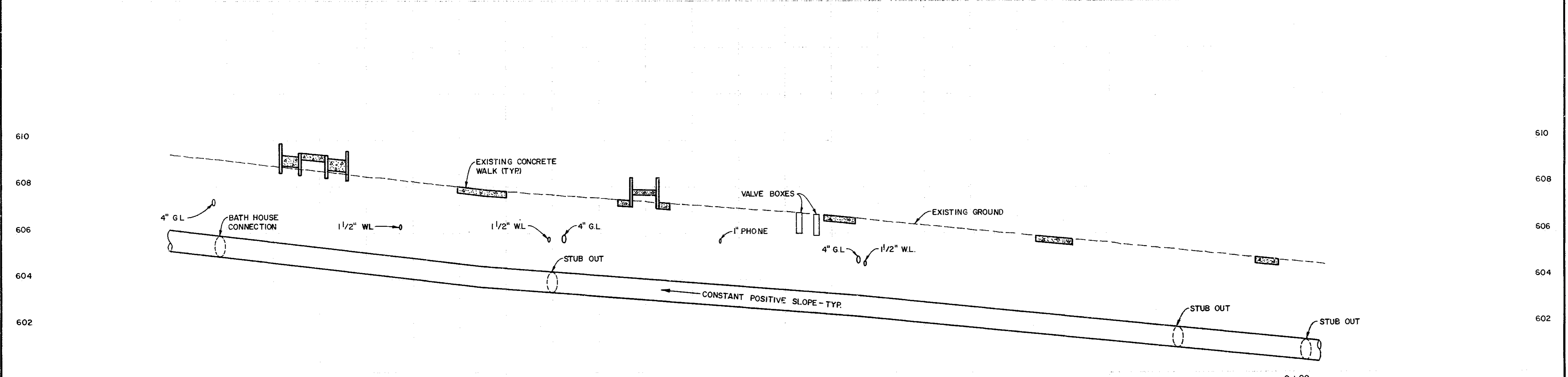
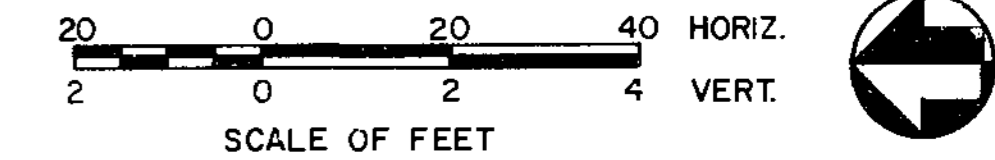
SEE DETAILS SHEET 9 FOR TYPICAL BATHHOUSE CONNECTIONS.

DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET		DRAWING NO.
DRAWN: M.J. NEIMES		BATHHOUSE ROW PLAN & PROFILE		128 41,035
TECH. REVIEW:				PKG. NO.
DATE: 4/1988				3
				OF 12



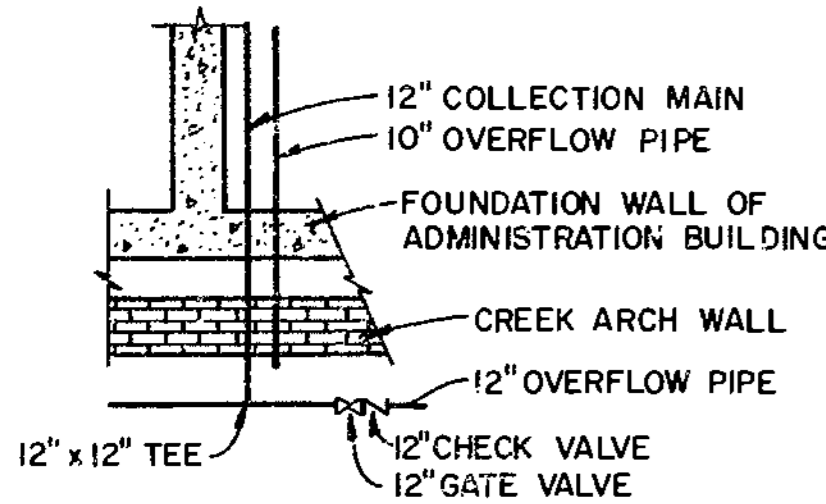
- NOTES**
1. PLUGGED AND OR ABANDONED PIPE NOT SHOWN.
 2. FOR CLARITY, ALL VALVES AND METERS NOT SHOWN. FOR VALVING AND METERING DETAILS, REFER TO SHEETS IO AND II.
 3. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS SEE SHEET I.
 4. LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.

- REFERENCE DRAWINGS**
1. 128 41,021A (1985)
 2. 128 41,023B (1987)
 3. 128 41,031A (1987)



SEE DETAILS, SHEET 9 FOR TYPICAL BATHHOUSE CONNECTIONS.

DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET BATHHOUSE ROW PLAN & PROFILE	DRAWING NO. 128 41,035
DRAWN: MONEIMES			PKG. NO.
TECH. REVIEW:			SHEET 4
DATE: 4/1988			OF 12

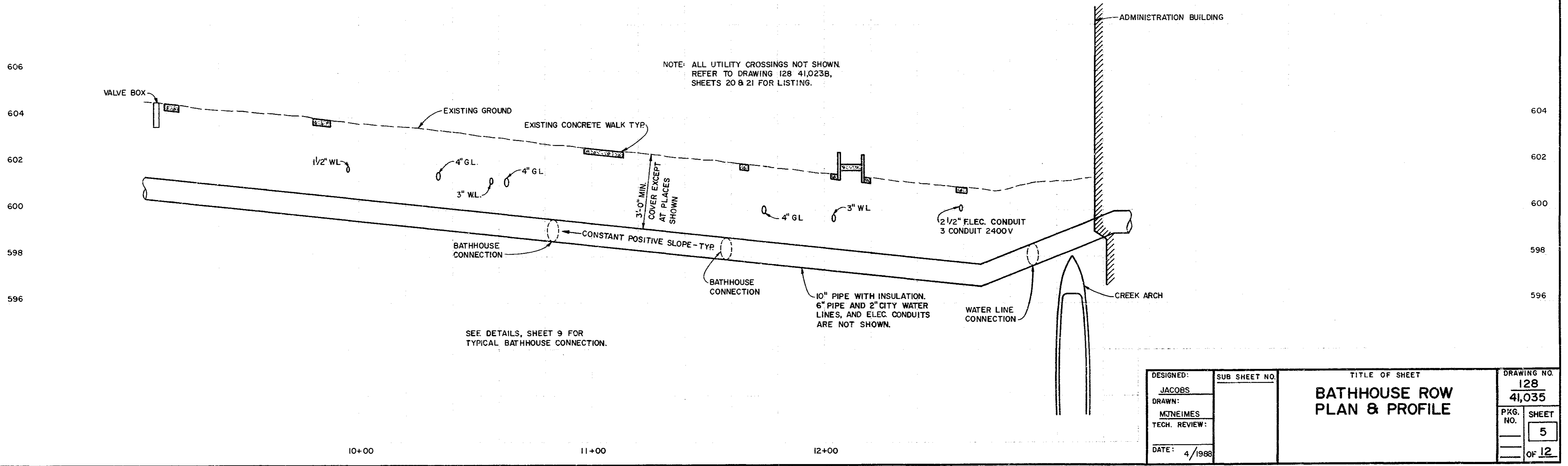
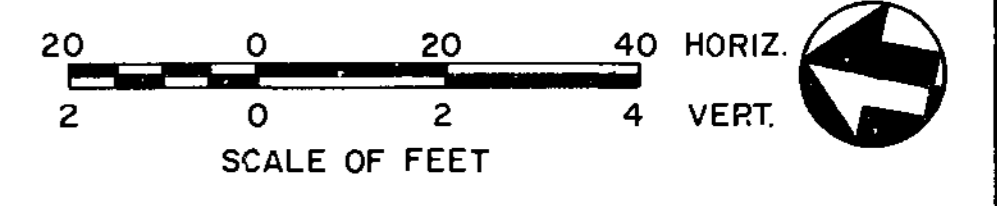
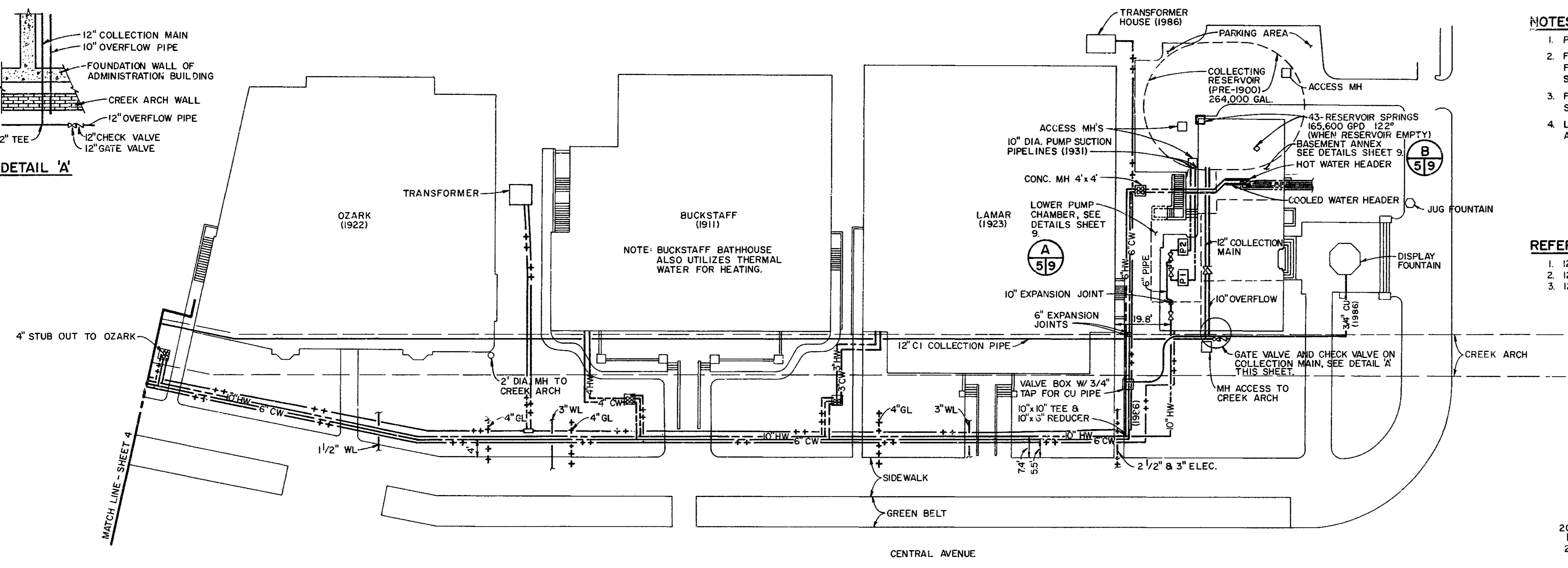


DETAIL 'A'

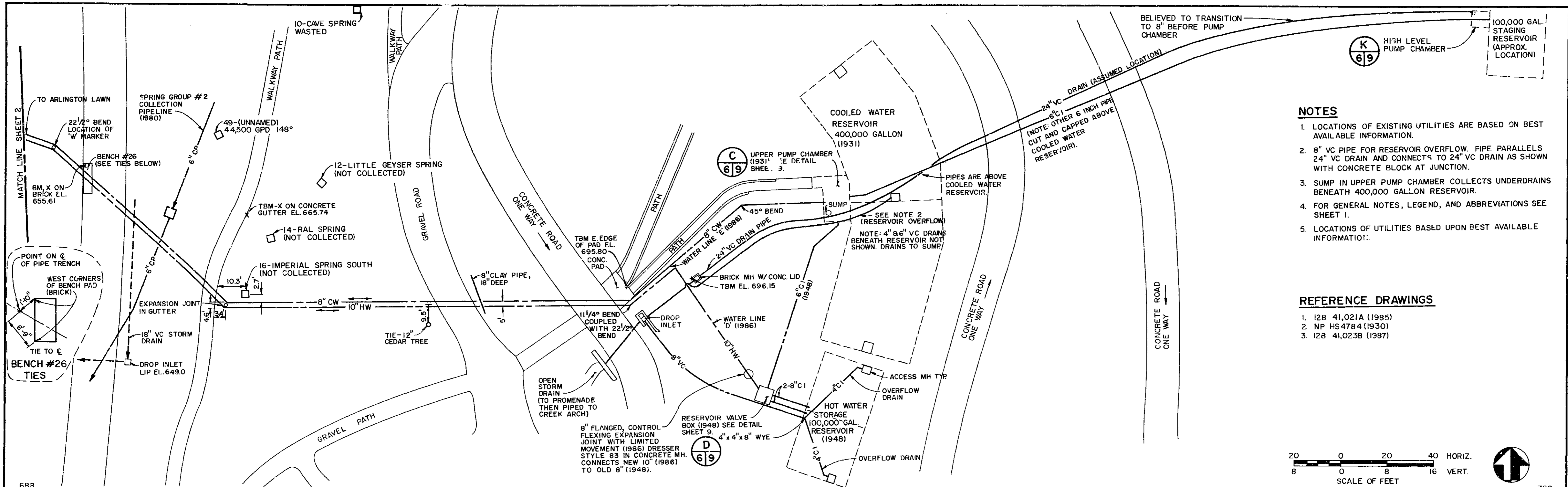
- NOTES**
1. PLUGGED AND/OR ABANDONED PIPE NOT SHOWN.
 2. FOR CLARITY, ALL VALVES AND METERS NOT SHOWN FOR VALVING AND METERING DETAILS, REFER TO SHEETS 10 AND 11.
 3. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS SEE SHEET 1.
 4. LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.

REFERENCE DRAWINGS

1. 128 41,021A (1985)
2. 128 41,023B (1987)
3. 128 41,031A (1987)

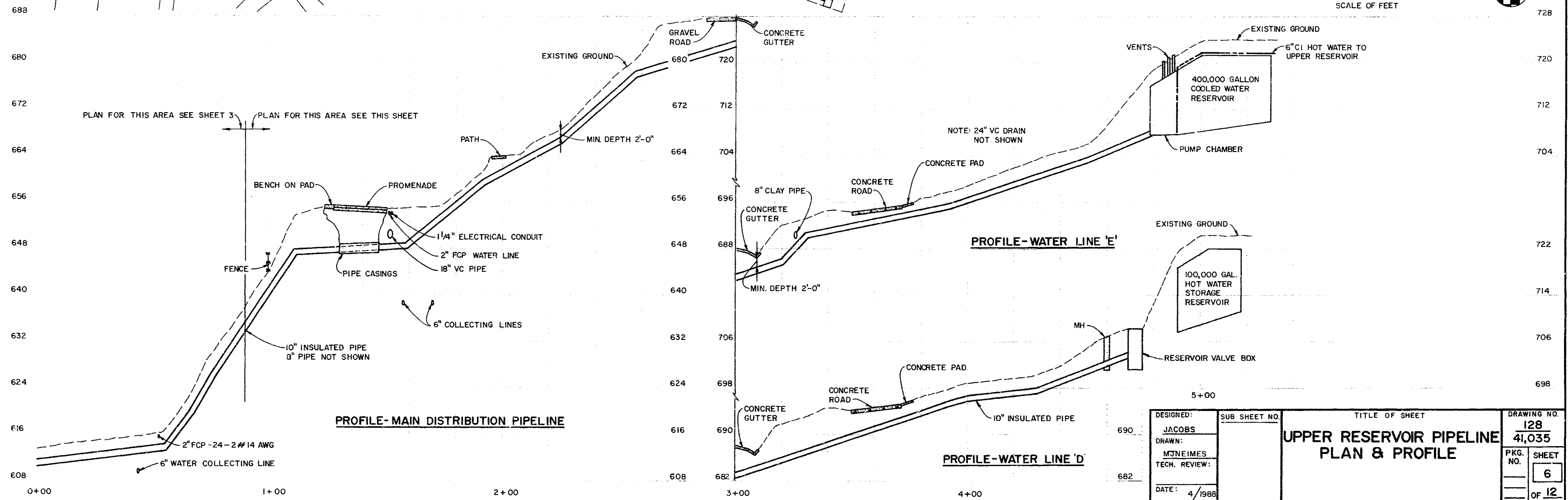
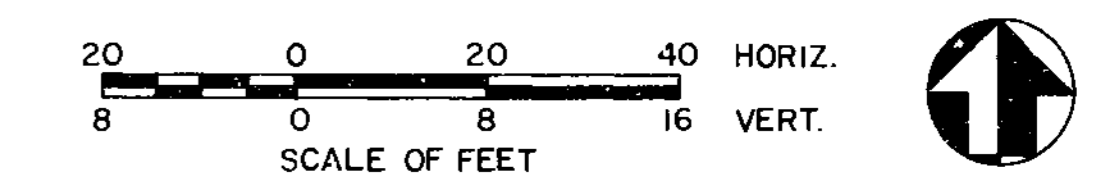


DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET BATHHOUSE ROW PLAN & PROFILE	DRAWING NO. 128 41,035
DRAWN: MCNEIMES			PKG. NO.
TECH. REVIEW:			SHEET 5
DATE: 4/1988			OF 12



- NOTES**
- LOCATIONS OF EXISTING UTILITIES ARE BASED ON BEST AVAILABLE INFORMATION.
 - 8" VC PIPE FOR RESERVOIR OVERFLOW. PIPE PARALLELS 24" VC DRAIN AND CONNECTS TO 24" VC DRAIN AS SHOWN WITH CONCRETE BLOCK AT JUNCTION.
 - SUMP IN UPPER PUMP CHAMBER COLLECTS UNDERDRAINS BENEATH 400,000 GALLON RESERVOIR.
 - FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS SEE SHEET 1.
 - LOCATIONS OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.

- REFERENCE DRAWINGS**
- I28 41,021A (1985)
 - NP HS4784 (1930)
 - I28 41,023B (1987)



DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET UPPER RESERVOIR PIPELINE PLAN & PROFILE	DRAWING NO. 128 41,035
DRAWN: MONEIMES			PKG. NO.
TECH. REVIEW:			SHEET 6
DATE: 4/1988			OF 12

NOTES

1. LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.
2. FOR VALVING AND METERING DETAILS, REFER TO SHEETS 10 AND 11.
3. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS, SEE SHEET 1.
4. SPRING GROUP 2 CONSTRUCTED 1980. SPRING GROUP 1 DETAILS GIVEN ON PREVIOUS SHEETS.
5. ABANDONED AND/OR PLUGGED LINES NOT SHOWN.
6. TOPOGRAPHY FROM DRAWINGS 128 41,021A (1985).

REFERENCE DRAWINGS

1. 128 41,015A (1978)
2. 128 41,021A (1985)
3. 128 41,023B (1987)
4. 128 60,001 (1981)

SPRING GROUP 2 INFORMATION

SPRING No.	SPRING NAME	FLOW (GPD)	TEMP (°F)
1	EGG SPRING	33,100	138°
3	ARLINGTON SPRING	28,800	140°
5	AVENUE SPRING	10,200	141°
7	IMPERIAL SPRING NORTH	3,300	139°
8	CRYSTAL SPRING	9,400	129°
10	CAVE SPRING		
21C	ALUM SPRING	900	
22	SUPERIOR SPRING SOUTH	2,900	
23	TWIN SPRING NORTH	1,400	145°
24	TWIN SPRING SOUTH	3,300	147°
26	PALACE SPRING	11,500	146°
30	ARCH SPRING		
31	HAYWOOD SPRING	21,000	136°
32	JOHN W. NOBLE SPRING		
47		28,300	148°
48		24,000	144°
49		44,500	148°



MATCH LINE SHEET 8

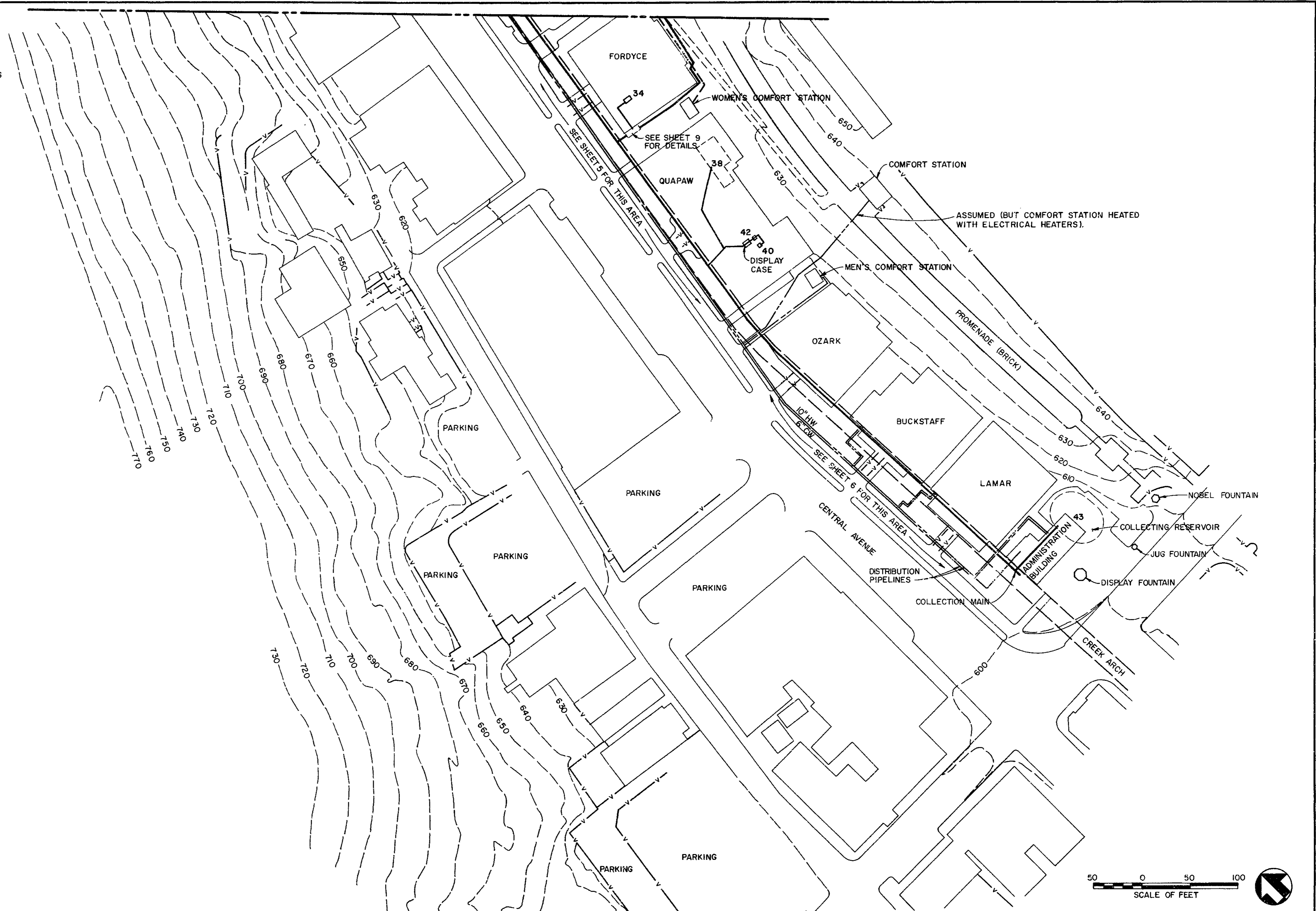
DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET SPRING COLLECTION GROUP #2 (NORTH HALF)	DRAWING NO. 128 41,035
DRAWN: MJNEIMES			PKG. NO.
TECH. REVIEW:			SHEET 7
DATE: 4/1988			OF 12

NOTES

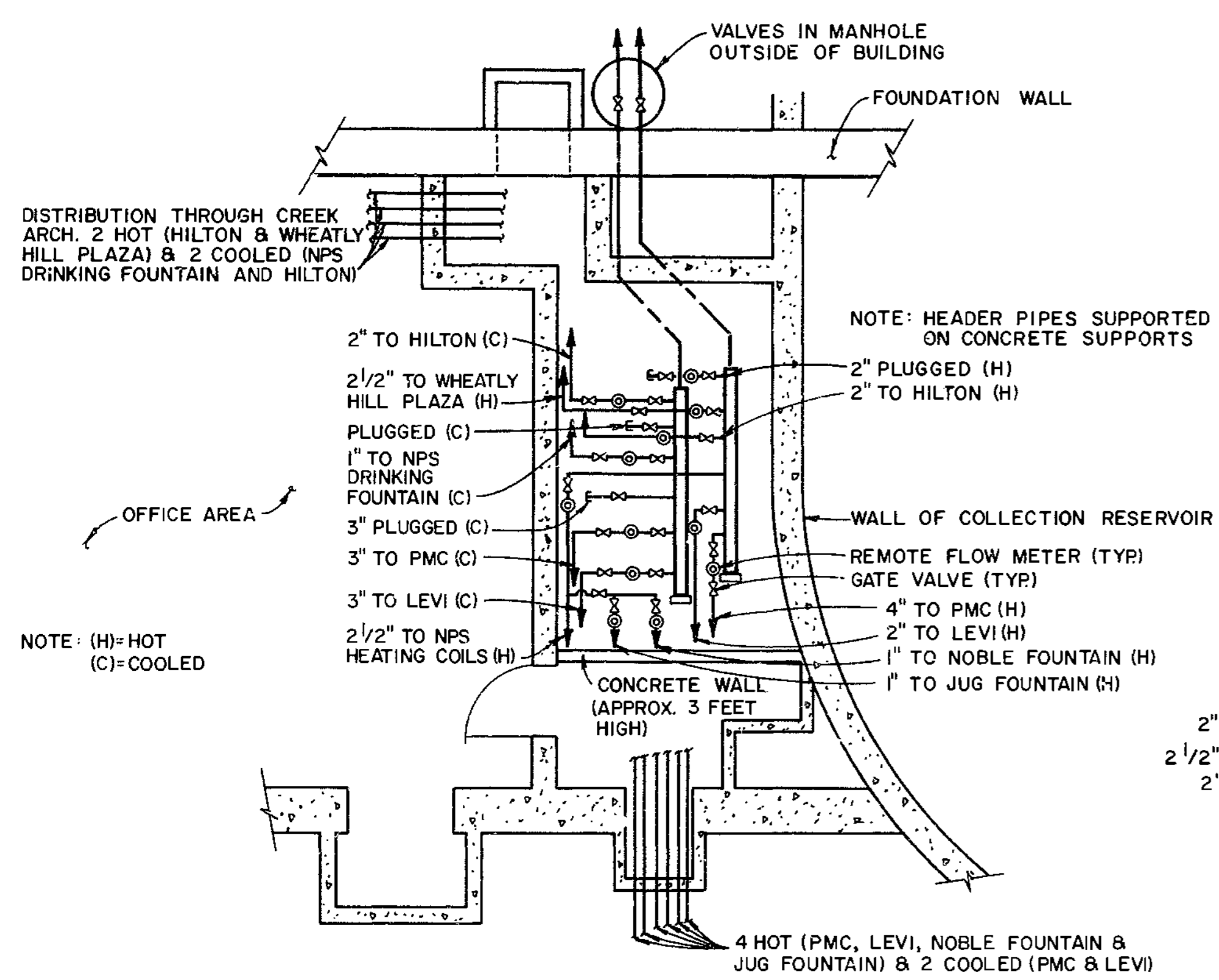
1. LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.
2. FOR VALVING AND METERING DETAILS, REFER TO SHEETS 10 AND 11.
3. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS, SEE SHEET 1.
4. SPRINGS THIS SHEET CONSTRUCTED 1981.
5. ABANDONED AND/OR PLUGGED LINES NOT SHOWN.
6. TOPOGRAPHY FROM DRAWINGS 128 41,021 A (1985).
7. FOR SPRING INFORMATION, SEE SHEET 7.

REFERENCE DRAWINGS

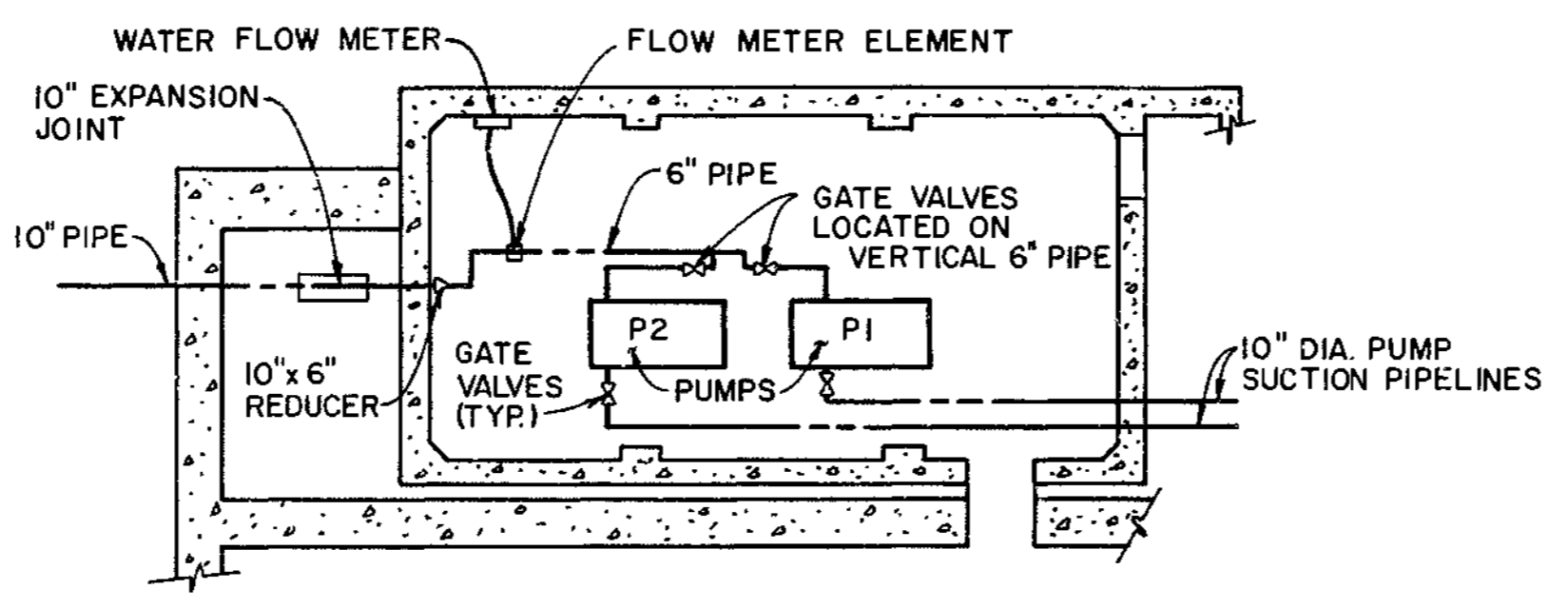
1. 128 41,015 A (1978)
2. 128 41,021 A (1985)
3. 128 41,023 B (1987)
4. 128 60,001 (1981)



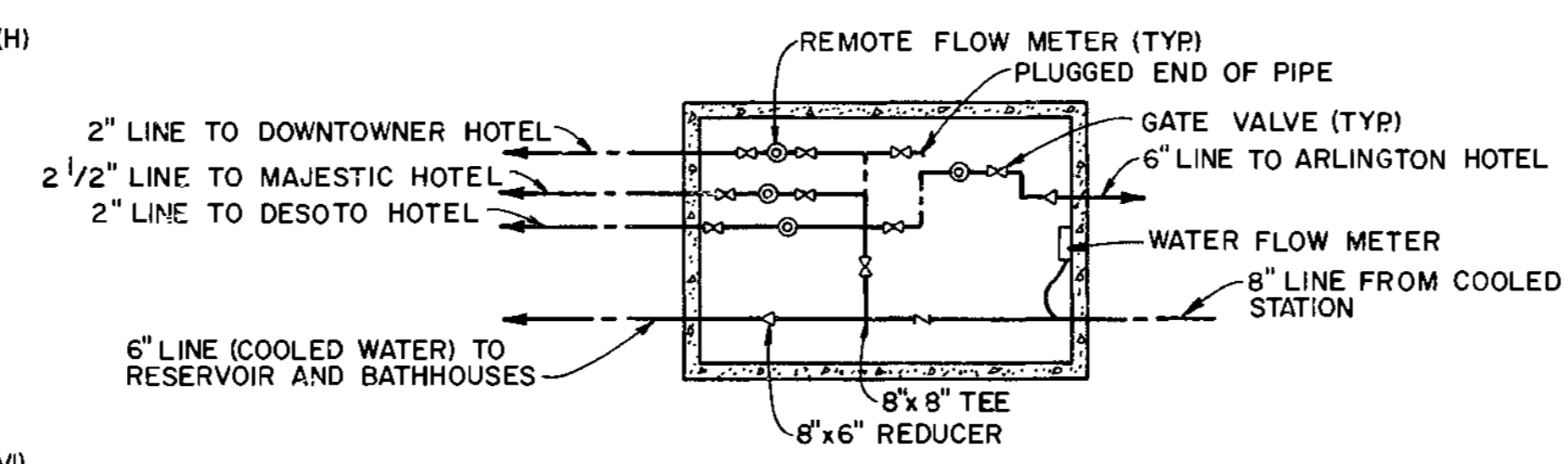
DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET SPRING COLLECTION GROUP #2 (SOUTH HALF)	DRAWING NO. 128 41,035
DRAWN: MJEIMES			PKG. NO. SHEET 8
TECH. REVIEW:			OF 12
DATE: 4/1988			



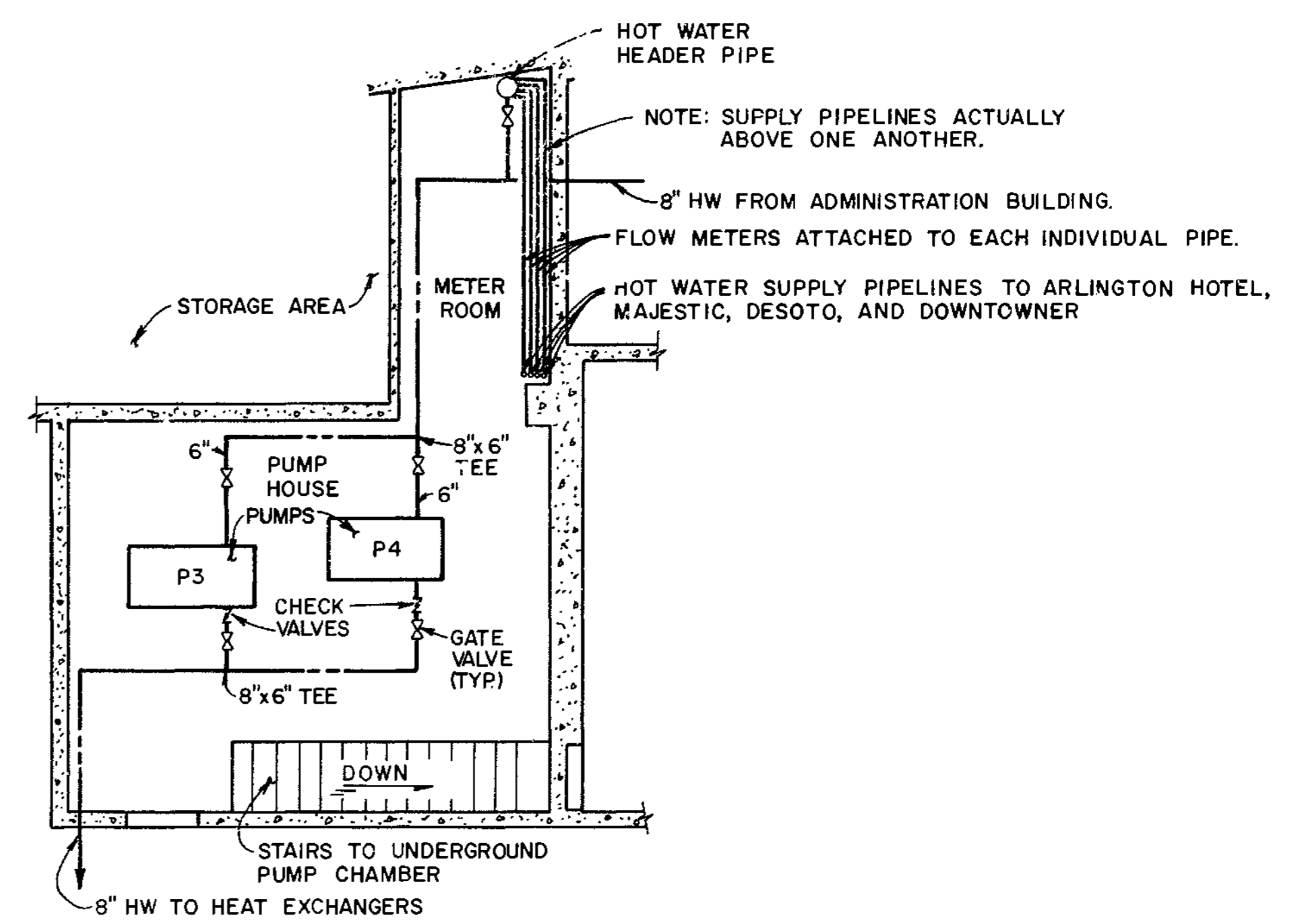
B BASEMENT ANNEX
SCALE: 1"=5'
5/9



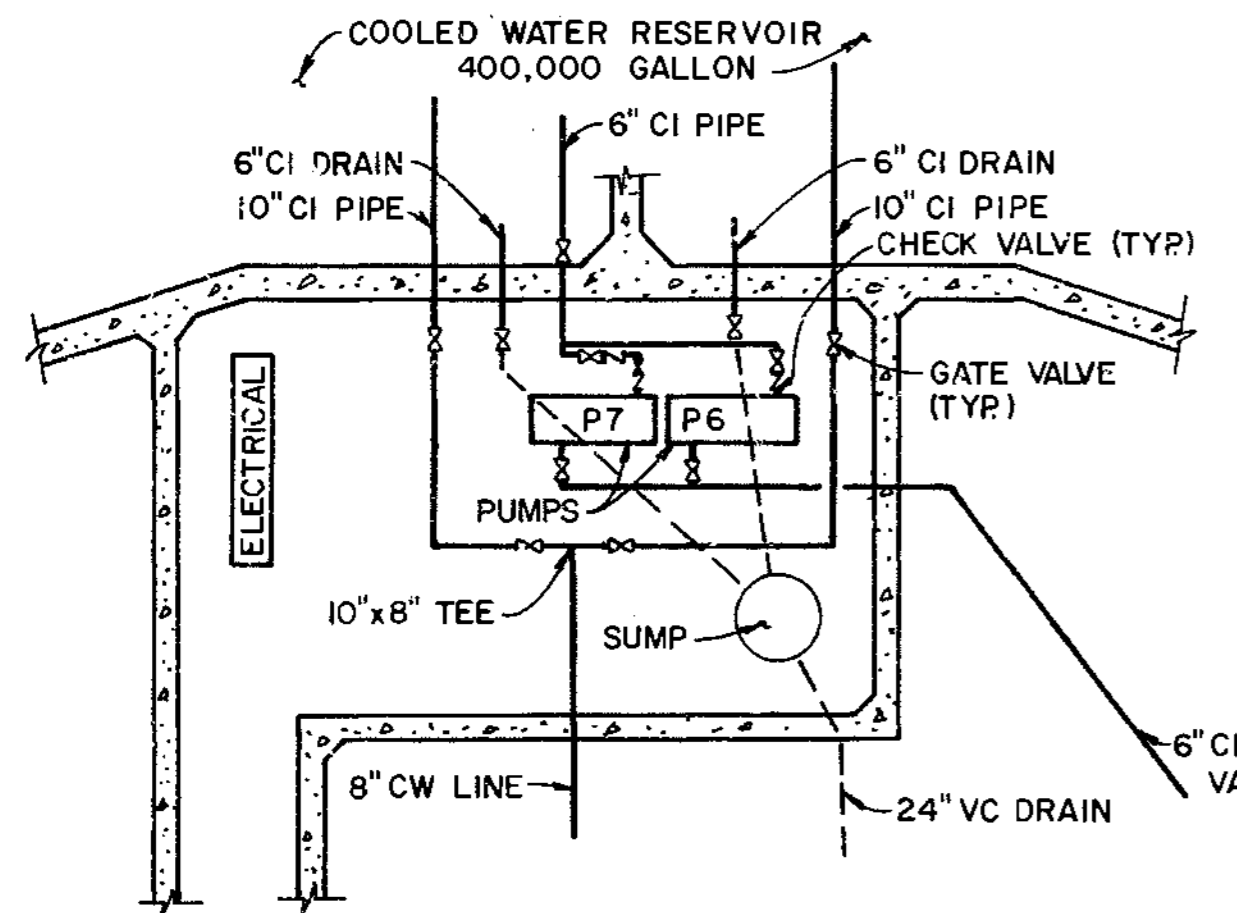
A LOWER PUMP CHAMBER
SCALE: 1"=8'
5/9



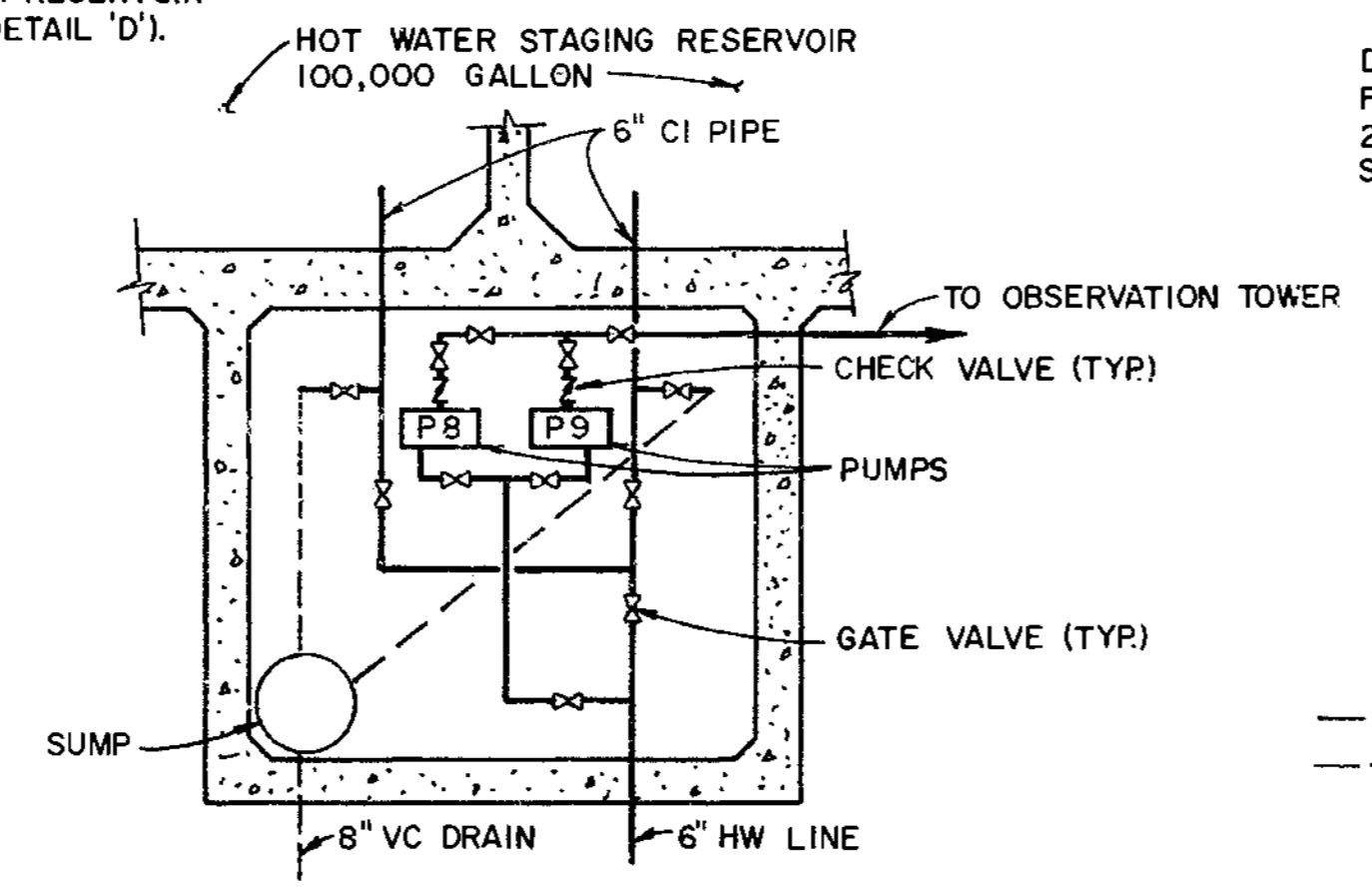
E COOLED WATER VALVE CHAMBER
SCALE: 1"=5'
2/9



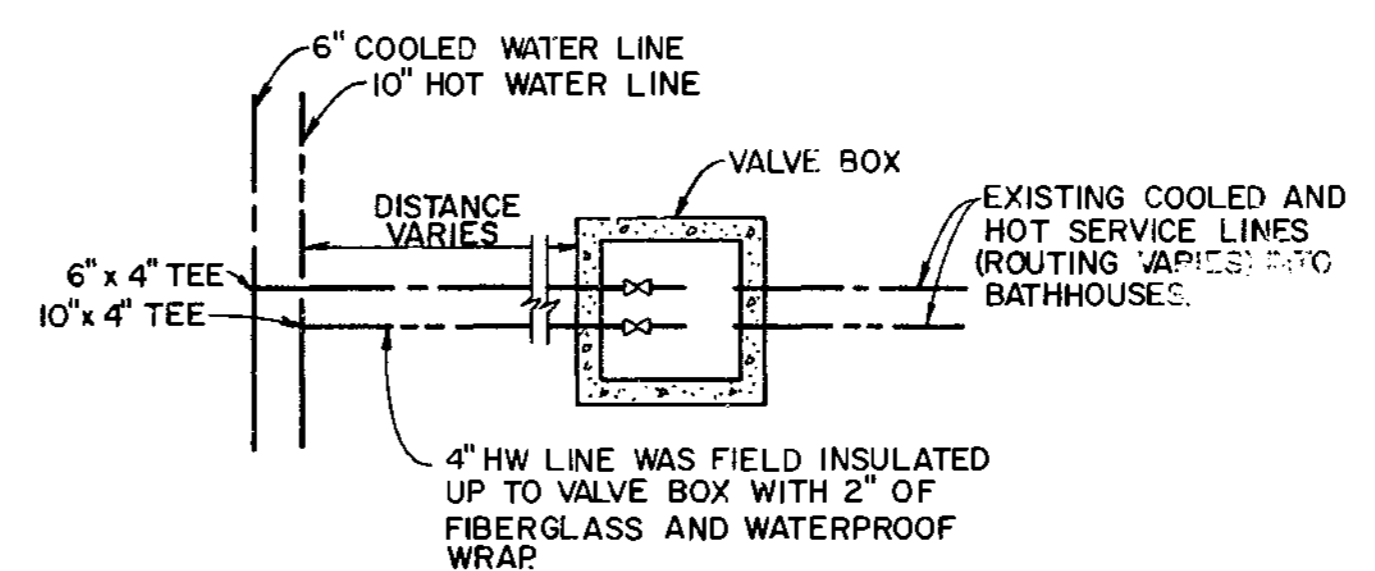
F PUMP HOUSE AND METER ROOM
SCALE: 1"=5'
2/9



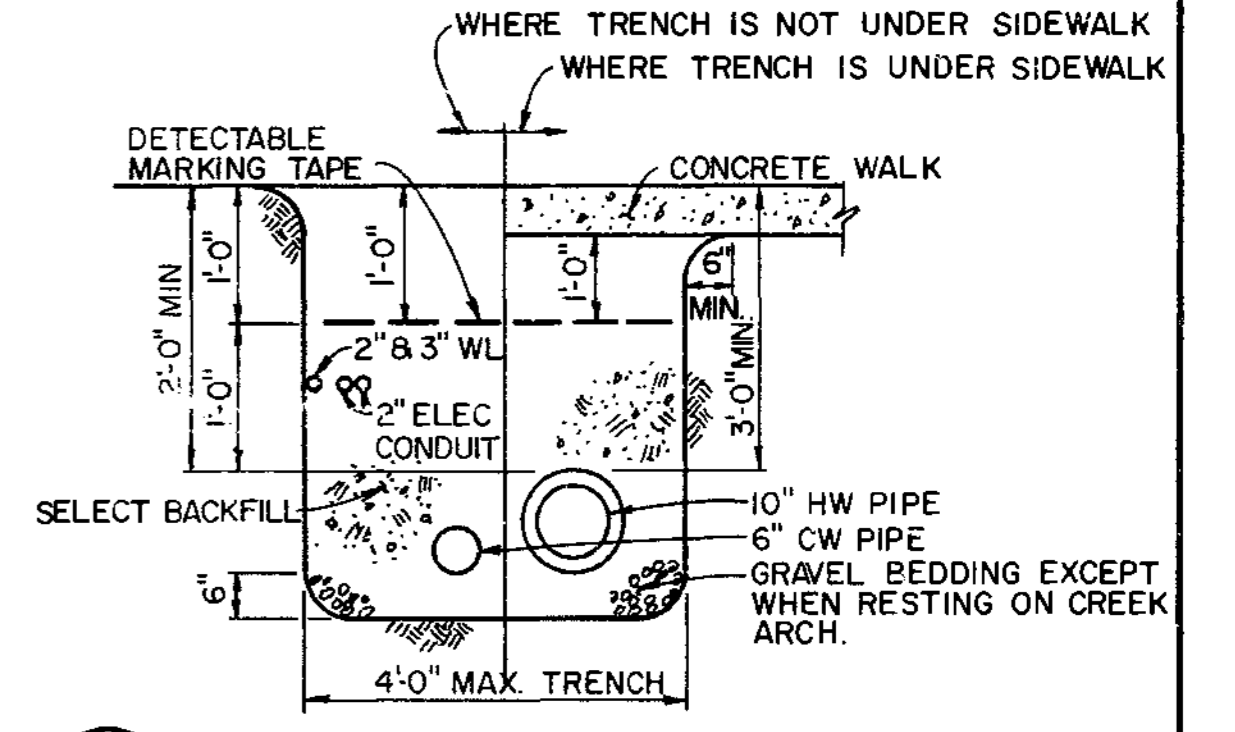
C UPPER PUMP CHAMBER
SCALE: 1"=5'
6/9



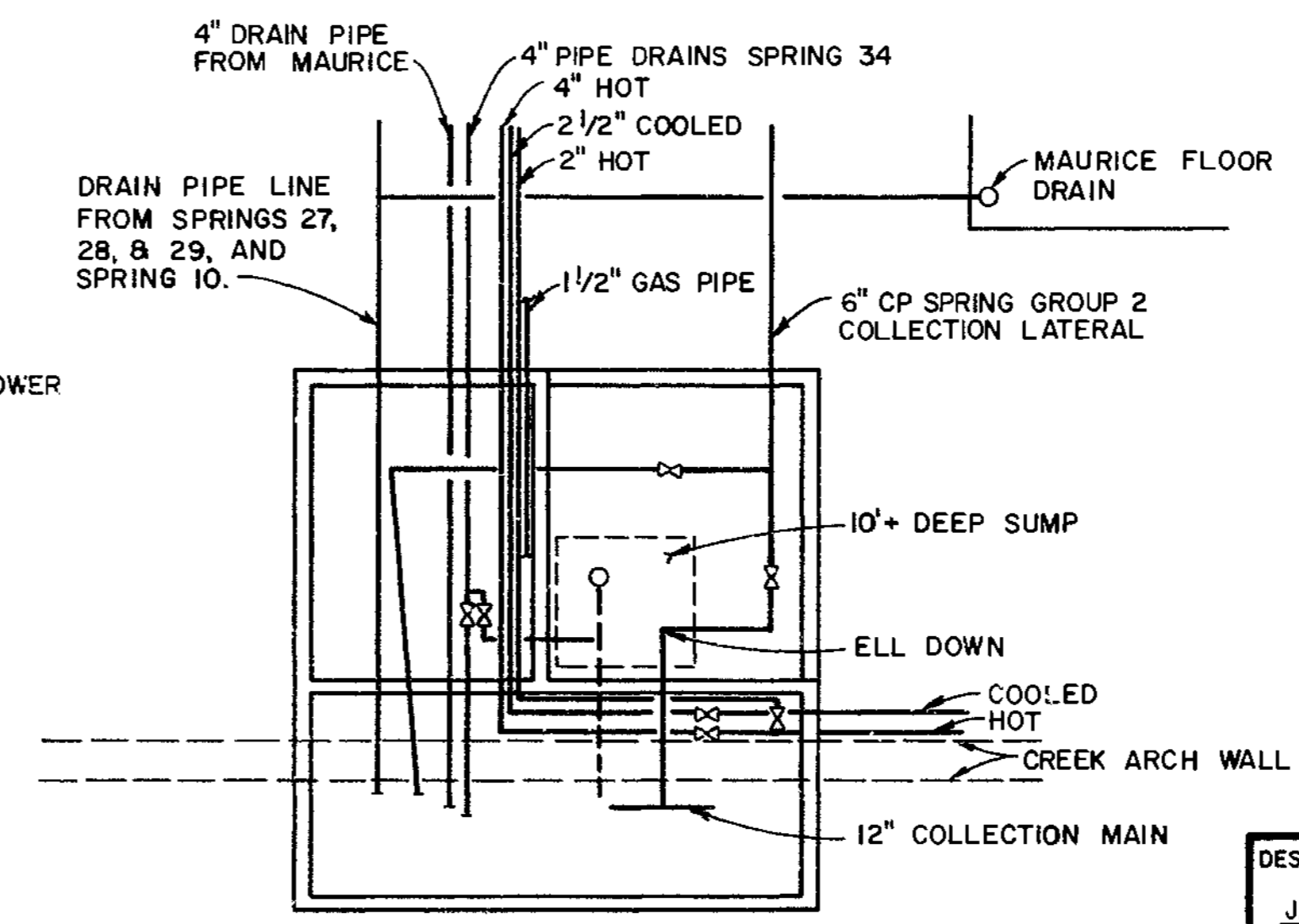
K HIGH LEVEL PUMP CHAMBER
NOT TO SCALE
6/9



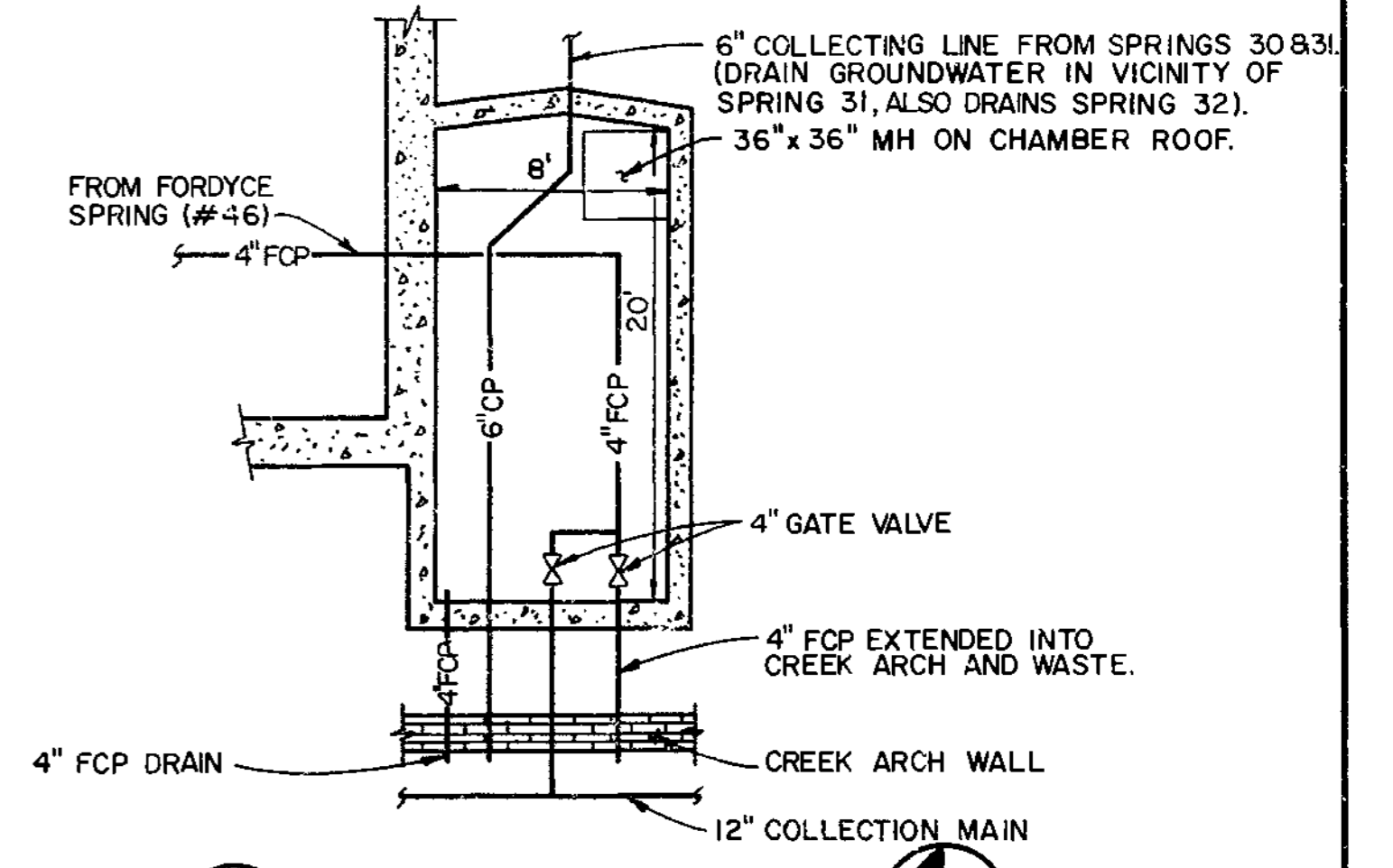
G BATHHOUSE CONNECTION
SCALE: 1"=4'
3/9



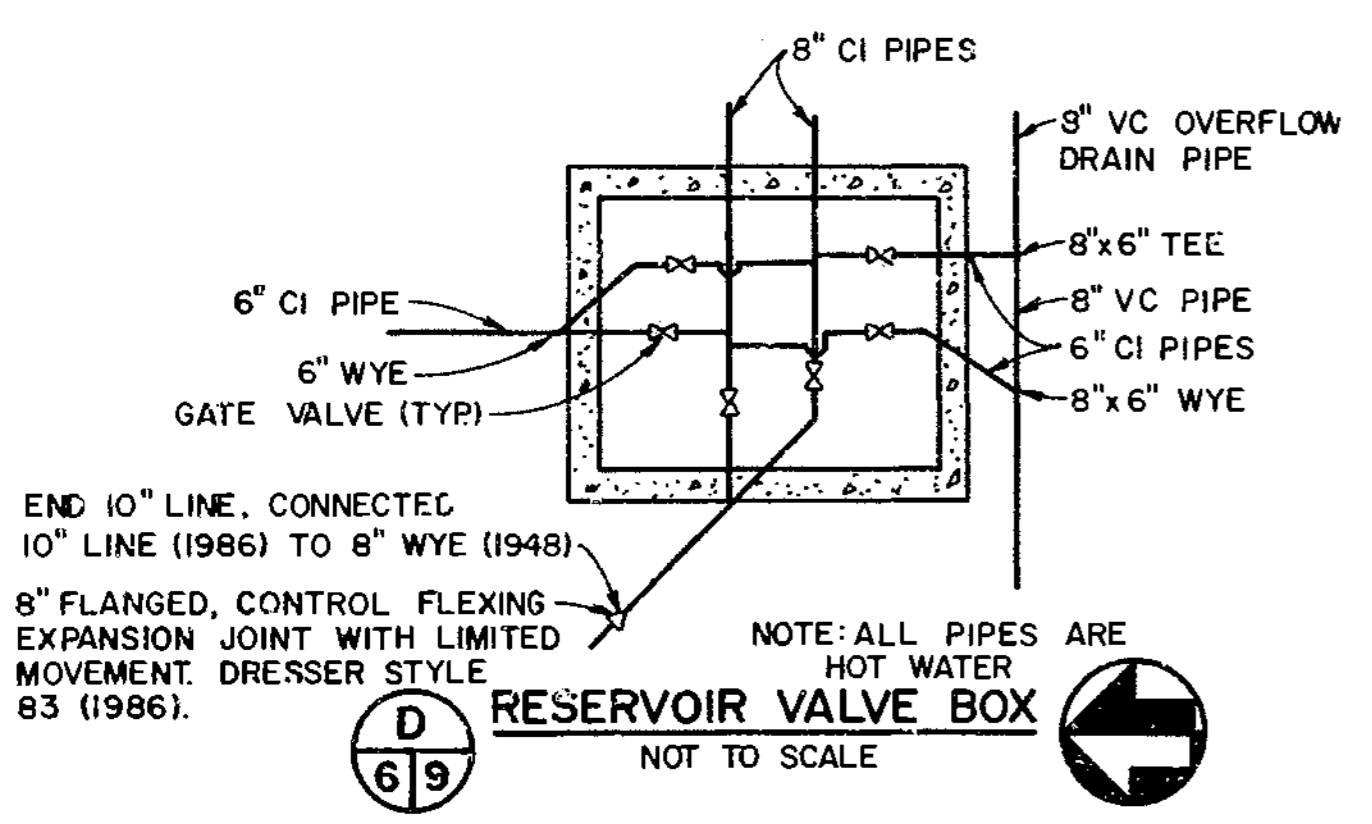
H TRENCH SECTION
NOT TO SCALE
3/9



I MAURICE VALVE PIT
NOT TO SCALE
4/9



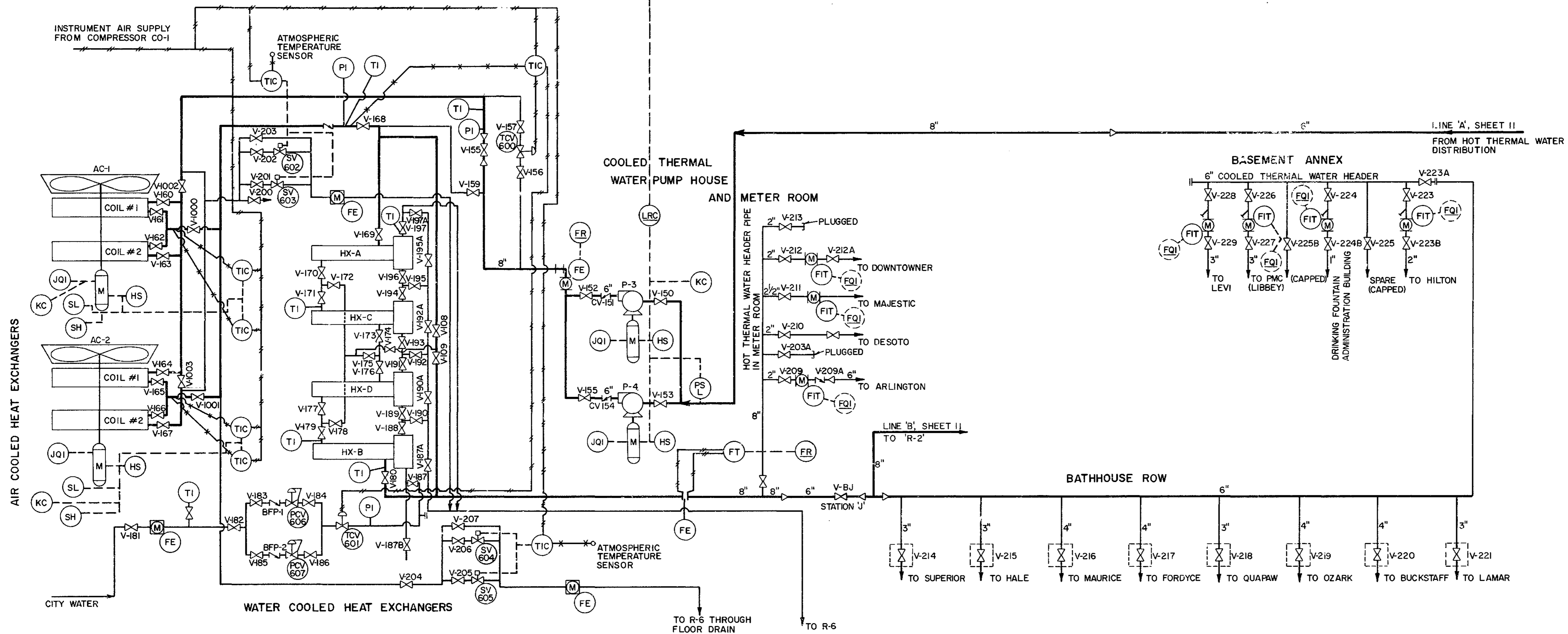
J FORDYCE VALVE CHAMBER
NOT TO SCALE
4/9



D RESERVOIR VALVE BOX
NOT TO SCALE
6/9

DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET DETAILS	DRAWING NO. 128 4,035
DRAWN: MJEIMES			PKG. NO.
TECH. REVIEW:			SHEET 9
DATE: 4/1988			OF 12

FROM LT
R-2



LEGEND

SYMBOL	DESCRIPTION
	COMPRESSED AIR
	CAPILLARY TUBES
	ELECTRICAL SIGNAL
	GATE VALVE
	CHECK VALVE
	REDUCER
	PUMP
	MOTOR
	ELEMENTS AS ABBREVIATED
	PANEL MOUNT
	REMOTE
	LOCAL INDICATING FLOW METER
	TURBINE METER
	CONTROL VALVE
	PRESSURE CONTROL VALVE
	SOLENOID VALVE

ABBREVIATIONS

EQUIPMENT:
AC AIR COOLERS
HX HEAT EXCHANGERS
P PUMPS
R RESERVOIRS
SP SUMP PUMPS
INSTRUMENTATION:
FE FLOW ELEMENT
FI FLOW INDICATOR
FIT FLOW INDICATOR TRANSMITTER
FQI FLOW TOTALIZER INDICATOR
FR FLOW RECORDER
FT FLOW TRANSMITTER
TEMPERATURE:
TCV TEMPERATURE CONTROL VALVE
TI TEMPERATURE INDICATOR
TIC TEMPERATURE INDICATOR CONTROLLER
PRESSURE:
PCV PRESSURE CONTROL VALVE
PI PRESSURE INDICATOR
PS PRESSURE SWITCH
PSH PRESSURE SWITCH HIGH
PSL PRESSURE SWITCH LOW

LEVEL:

LIC LEVEL INDICATOR CONTROLLER
LRC LEVEL RECORDER CONTROLLER
LT LEVEL TRANSMITTER

MISC:

BFP BACK FLOW PREVENTOR
CO COMPRESSOR
CV CHECK VALVE
HS HAND SWITCH
JQI CUMMULATIVE WATT METER INDICATOR
KS TIMER
M TURBINE METER
MCV MOTOR CONTROL VALVE
SL SPEED SWITCH LOW
SV SOLENOID VALVE
ZS LIMIT SWITCH

LIST OF RESERVOIRS

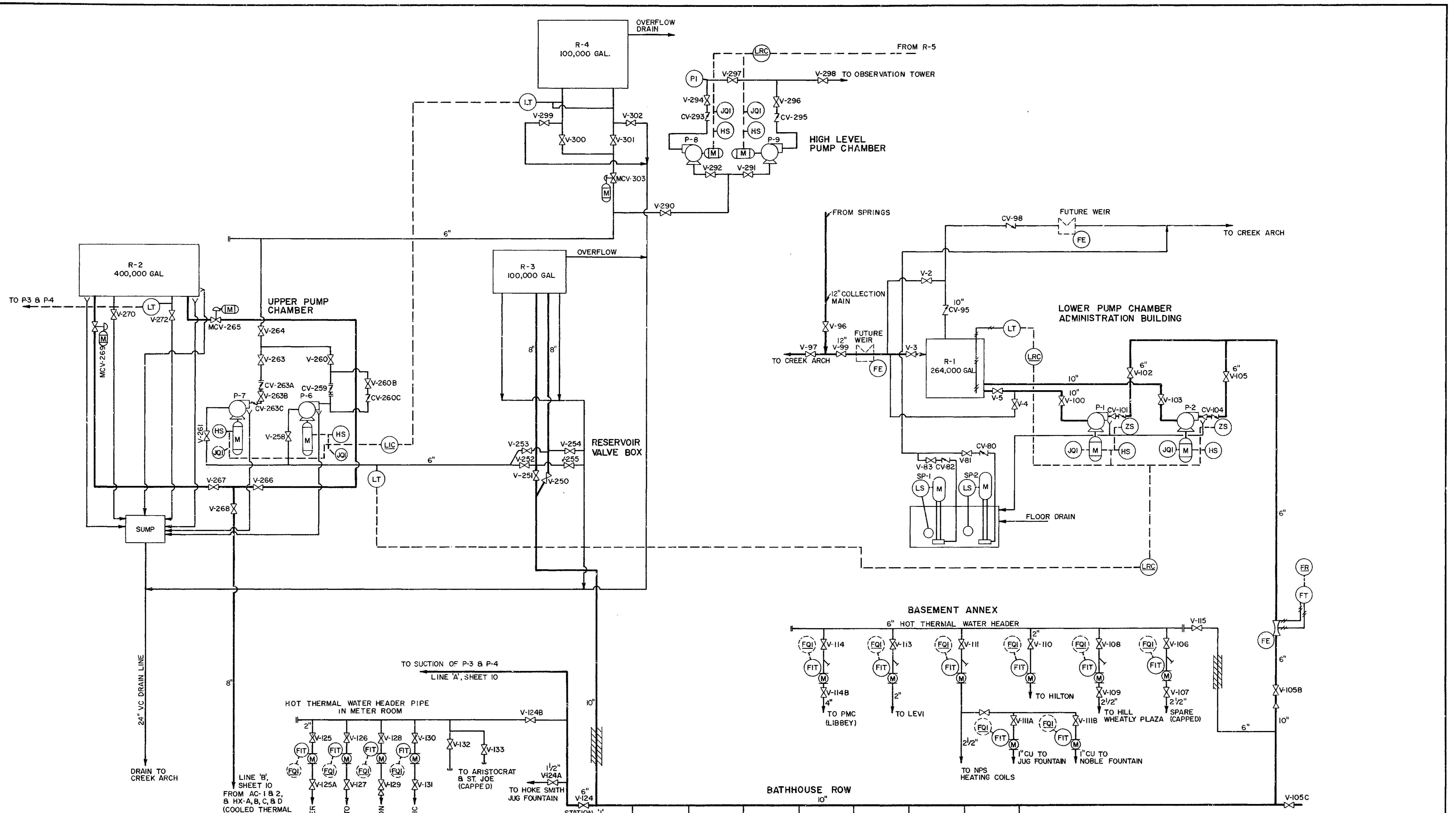
R-1	264,000 GALLON HOT THERMAL WATER BASEMENT ADMINISTRATION BUILDING ELEV. 576±.
R-2	400,000 GALLON COOLED THERMAL WATER HOT SPRINGS MOUNTAIN ELEV. 721±.
R-3	100,000 GALLON HOT THERMAL WATER HOT SPRINGS MOUNTAIN ELEV. 721±.
R-4	100,000 GALLON HOT THERMAL WATER STAGING RESERVOIR, HOT SPRINGS MOUNTAIN ELEV. 812±.
R-5	5,000 GALLON HOT THERMAL WATER AT OBSERVATION TOWER ELEV. 1000±.
R-6	CITY WATER COLLECTION RESERVOIR FOR LAWN WATERING PURPOSES 11,600 GALLONS (APPROX.).

DESIGNED:	FRITZLER
DRAWN:	MJNEIMES
TECH. REVIEW:	
DATE:	4/1988

SUB SHEET NO.	
PKG. NO.	10
SHEET	OF 12

TITLE OF SHEET
PROCESS AND INSTRUMENTATION DIAGRAMS
COOLED WATER DISTRIBUTION SYSTEM

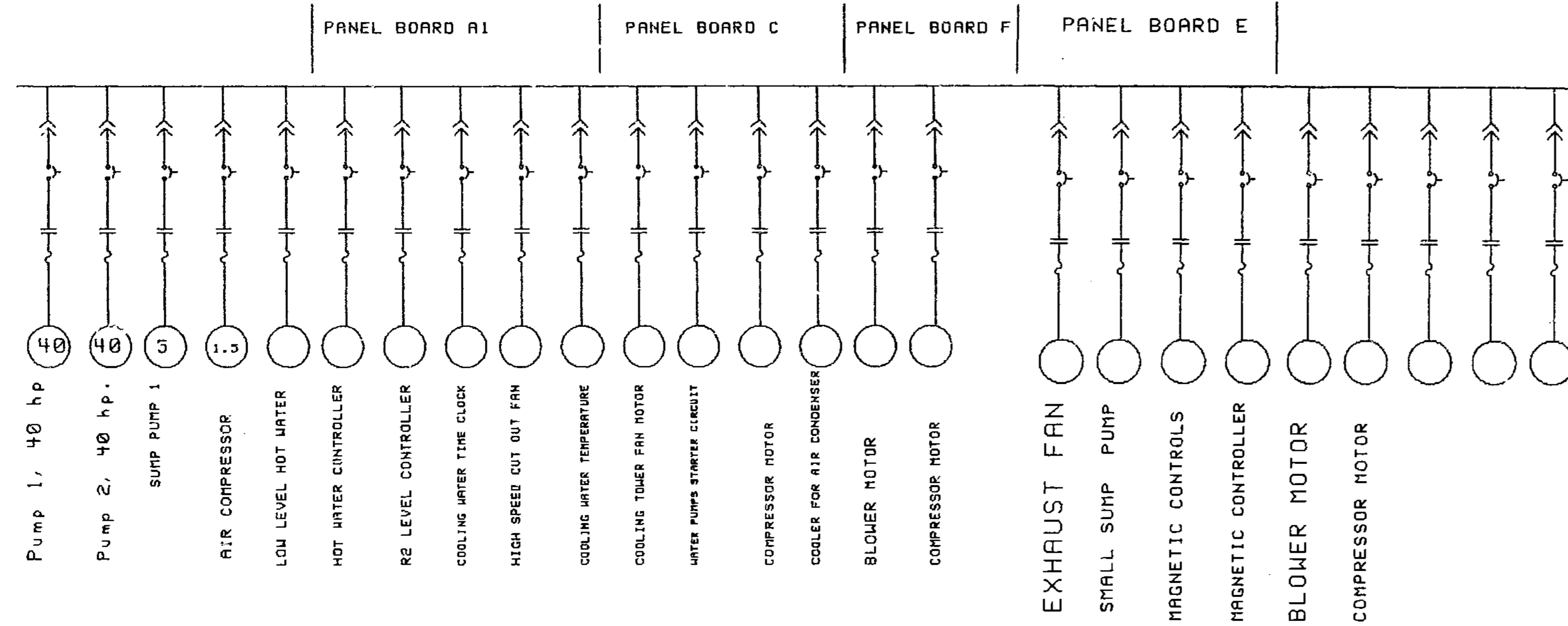
DRAWING NO.	128
	41,035
PKG. NO.	10
SHEET	OF 12



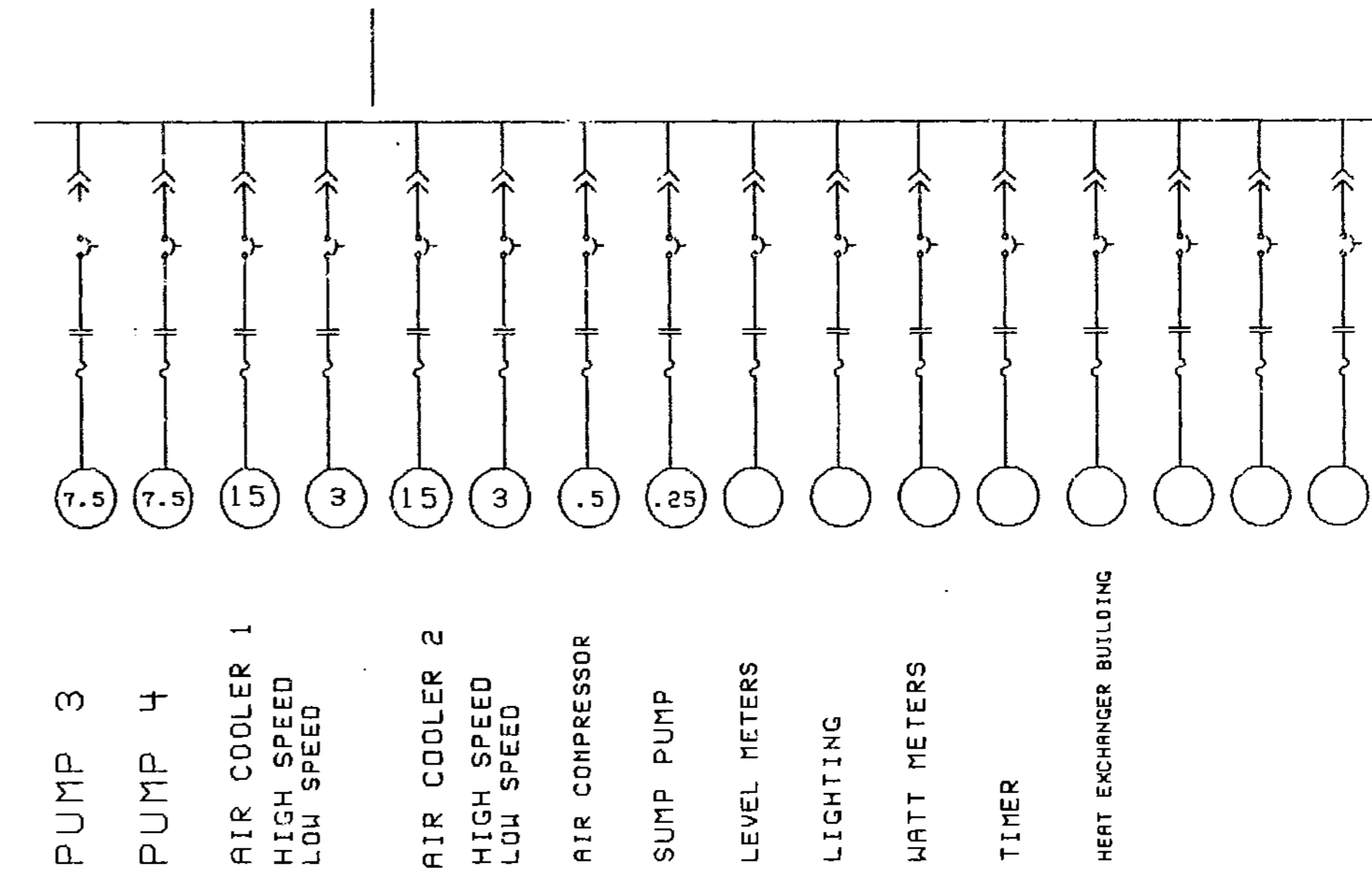
DESIGNED: FRITZLER	SUB SHEET NO.	TITLE OF SHEET PROCESS AND INSTRUMENTATION DIAGRAMS	DRAWING NO. 128
DRAWN: MONEIMES			4,035
TECH. REVIEW:			PKG. NO.
DATE: 4/1988			SHEET 11
TO SUPERIOR		OF 12	

HOT WATER DISTRIBUTION SYSTEM

MCC MAIN COLLECTION RESERVOIR PUMP CHAMBER

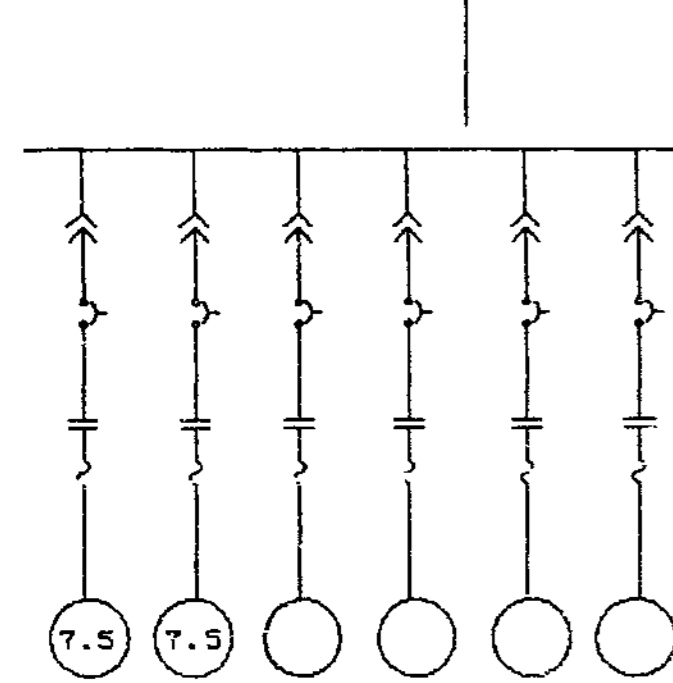


MCC COOLED WATER PUMP CHAMBER



REF. DWG.
NPS DRAWING NO.
NP - HS 5311

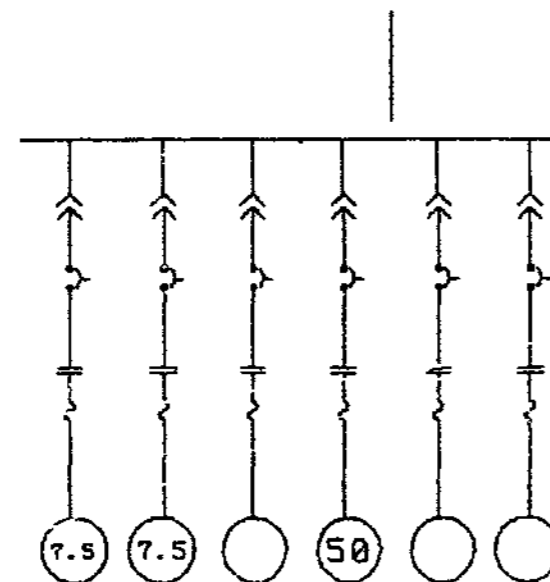
LOW LEVEL PUMP CHAMBER



PUMP 8
PUMP 7
LIGHTING

REF. DWG.
SQUARE D COMPANY
C50126 - 468 - 121715 AE
DATE 2/29/87

UPPER LEVEL PUMP CHAMBER



PUMP 8
PUMP 9
LIGHTING
HEATER

REF. DWG.
INSTRUMENT SUPPLY
FROM MCC ELEMENTARY DIAGRAM UPPER LEVEL

ONE LINE DIAGRAM

- BUS OF CABLE RUN
- - - - - EXISTING OR FUTURE BUS
- CONTROL OR METERING CIRCUIT
- - - - - INTERLOCK BETWEEN DEVICES CONNECTED
- ⊕ COMBINATION MOTOR STARTER WITH MOTOR CIRCUIT PROTECTOR, NEMA CONTACTOR
- ⊕ POTENTIAL TRANSFORMER, DRODOWN TYPE WITH CURRENT LIMITING FUSES
- ⊕ DISTRIBUTION TRANSFORMER
- ⊕ CURRENT TRANSFORMER (INDICATE TURN RATIO AND QUANTITY)
- ⊕ DISTRIBUTION TRANSFORMER
- ⊕ TRANSFORMER CONNECTIONS-DELTA PRIMARY, GROUNDED WYE SECONDARY
- ⊕ TRANSFORMER-SECONDARY WYE RESISTANCE GROUNDED (GIVE AMPERE RATING IN SECONDS)
- ⊕ MOULDED CASE CIRCUIT BREAKER, 600V, MANUALLY OPERATED, 3 OVERLOAD ELEMENTS (GIVE FRAME AND TRIP RATING)
- ⊕ POWER AIR CIRCUIT BREAKER, 600V DRODOWN TYPE, MANUALLY OPERATED, STORED ENERGY MECHANISM (ELECTRICALLY OPERATED IF MARKED "E - OP")
- ⊕ POWER CIRCUIT BREAKER, 5KV OR 15KV (AS NOTED)
- ⊕ FUSED DISCONNECT SWITCH (TYPE AND RATING AS SPECIFIED)
- ⊕ FUSED CUTOUT
- ⊕ KEY INTERLOCK
- ⊕ CAPACITOR
- ⊕ INDUCTION MOTOR
- ⊕ WOUND ROTOR MOTOR
- ⊕ SYNCHRONOUS MOTOR
- ⊕ MOTOR GENERATOR

- ⊕ MOTOR WITH CLUTCH
- ⊕ GROUND
- ⊕ CONTROL OR TRANSFER SWITCH
 - AS - AMMETER SWITCH
 - VS - VOLTMETER SWITCH
 - CS - CONTROL STATION
 - TS - TEST SWITCH
 - BS - BYPASS SWITCH
- ⊕ INDICATING METER
 - A - AMMETER
 - V - VOLTMETER
 - W - WATTMETER
 - PF - POWER FACTOR METER
 - WH - WATTHOUR METER
 - KWH - KILOWATT HOUR METER
 - WH - WATTHOUR METER WITH DEMAND REGISTER
 - VAR - VARIMETER

DESIGNED: FRITZLER	SUB SHEET NO.	TITLE OF SHEET ONE LINE - ELECTRICAL		DRAWING NO. 128
DRAWN: MJNEIMES				41,035
TECH. REVIEW:				PKG. NO. SHEET
DATE: 4/1988				12
				OF 12

Chlorinating Waterlines or Wells

<i>Pipe Section or Well Information</i>	<i>Pipe or Tank Dia. (in)</i>	<i>Pipe Length or Tank Height (ft)</i>	<i>Area (in²)</i>	<i>Gallons in Tub</i>	<i>Disinfectant Chlorine Sol % decimal</i>	<i>Desired Chlorine Residual (mg/L)</i>	<i>Gallons of Chlorine needed</i>	<i>Ounces of Chlorine Solution</i>	<i>Table Spoons</i>
Tub Scenario A	2	800	3.14	130.551	10.00%	1.5	0.002	0.25	0.50
Tub Scenario B	2	900	3.14	146.9	10.00%	1.5	0.002	0.28	0.56
Tub Scenario C	6	700	28.27	1028.1	10.00%	1.5	0.015	1.97	3.94
Tub Scenario D	2	650	3.14	106.1	10.00%	1.5	0.002	0.20	0.41
Tub Scenario E	2	613	3.14	100.0	10.00%	1.5	0.001	0.19	0.38

Notes: Changing the numbers in red will modify the amount of chlorine needed in gallons and ounces. If a well is disinfected, type in the diameter and

Caution: Highly chlorinated well water can damage grass and plants (under no circumstances should the water be discharged to the environment). Do not

If you have questions, please contact your local public health consultant or 402-661-1718 or the NPS OPH water committee chair

Basics for Small Water Systems in Oregon: Storage Tank Chlorination

Disinfection concentrations and times are based on AWWA Standard C652 for storage tanks cited in: OAR 333-061-0050 "Construction Standards" (10)(d) dated 19 Apr 2010, page 297

Question: How much chlorine is added to a tank?

Volume to be disinfected = 500 gallons

(input tank volume above in yellow shaded cell)

Chlorination Dose for Storage Tank of Volume Specified Above	Method A ^b	Method B ^c	Units
Chlorine Concentration	10	50	mg/L
Method Exposure Time	6 ^a or 24	6	hours
Chlorine Source Material...			
Bleach 5% Solution	0.10	0.50	gallons ^d
Bleach 12.5% Solution	0.04	0.20	gallons
Dry Chlorine (65% by wt)	0.06	0.32	pounds

Options for Disinfection by Chlorination:

Method A. Filling the tank or reservoir with a **10 mg/L** chlorine solution and allowing it to remain for **6^a or 24 hours** (see Table).

Method B. Filling the reservoir with a **50 mg/L** chlorine solution and allowing it to stand for **6 hours** (see Table).

Method C. Spraying or brushing on a **200 mg/L** chlorine solution and allowing it to remain for **3 hours** (calculation not provided).

(Chlorine Concentration values [yellow, or grey, cells] can be changed for custom calculations)

Note that to achieve Method concentration **add more** chlorine than specified here.

Important: The chlorine concentration should be measured to confirm Method's target concentration is reached. May need to dilute sample to test kit range.

^a Six (6) hours for addition by continuous feed during tank filling.

^b For **Pipes**, Method A using **24 hours** is applicable (shorter time at higher dose may be allowed, see Guidance).

^c For **Wells**, Method B using **24 hours** is applicable (shorter time at higher dose may be allowed, see Guidance).

^d Gallons to Cups conversion:
(gal x 16 = cups)

Gallons	Cups
1.6	25.6

Weight of dry chlorine with a lower percentage than 65% can be calculated by dividing 65% by the product's % chlorine (e.g., 65%/47%) times result in table.

DATA FOR SLOPE CALCULATIONS

(Data from FACT SHEET 3.7 in UNIT 3 - Operations of Staff Training Reference)

Reservoir (Gal)	Gallons 5% Bleach	Reservoir (Gal)	Pounds 65% Dry Chlorine
1000	0.5	10000	3.5
2000	1.0	20000	6.5
3000	1.5	30000	10
4000	2.0	40000	13
5000	2.5	50000	16
10000	5.0	100000	32
20000	10	200000	64
30000	15	300000	100
40000	20	400000	130
50000	25	500000	160

Slope 5% S₂O₈ = 0.0005 gal/gal Slope Dry Wt = 0.000323071 lb/gal

Conversion factors
 2.204623 lb/kg
 3.785412 L/gal

Reference C 0.000025 mg/L 2.51631E-05 mg/L
 25 mg/L reference concentration (from tables in training manual)

Number	Starting Location	Notes	Additional notes?
1	Cooled Thermal Reservoir Right Side Bottom	from 6" drain flush - 1 minute fully open	
2	Cooled Thermal Reservoir Right Side Bottom	from 6" drain flush - 1 minute fully open	
3	Cooled Thermal Reservoir Left Side Top	Approximately 8" from the top of the water	
4	Cooled Thermal Reservoir Right Side Top	Approximately 8" from the top of the water	
5	Thermal Vector Main Collector at Admin	from overflow weir	
6	Area in Cooling Reservoir	One sample from access of between buildings - 18" from surface	
7	Admin Cooling Reservoir	One sample from access of between buildings - 18" from surface	
8	Hot Thermal 100K Reservoir	from top flush - 1 minute fully open	
9	Hot Thermal 100K Reservoir	Approximately 8" from the top of the water	
10	Jug Fountain near Admin Entry has hot	Sample closest to the constant overflow line, reach min 135F and maintain for a min of 5 minutes	
11	Jug Fountain near Admin Entry has hot	Sample closest to the constant overflow line, reach min 135F and maintain for a min of 5 minutes	
12	Jug Fountain Phlebotomy across the road from Admin Entry has hot	Sample closest to the constant overflow line, reach min 135F and maintain for a min of 5 minutes	
13	Robot Fountain only for hot	Sample closest to the constant overflow line, reach min 135F and maintain for a min of 5 minutes	
14	Amphitheater Thermal	from valve box outside building or before RPZ right inside the building, flush - 100 gallons if needed	
15	Amphitheater Thermal	from valve box outside building or before RPZ right inside the building, reach min 130F and maintain for a min of 5 minutes	
16	Decktop Cooled Thermal	from valve box outside building or before RPZ right inside the building, flush - 100 gallons if needed	
17	Decktop Hot Thermal	from valve box outside building or before RPZ right inside the building, reach min 135F and maintain for a min of 5 minutes	
18	Low Cooled Thermal	from valve box outside building or before RPZ right inside the building, flush - 2,000 gallons if needed	
19	Low Hot Thermal	from valve box outside building or before RPZ right inside the building, reach min 135F and maintain for a min of 5 minutes	
20	Quarzo Cooled Thermal	from valve box outside building or before RPZ right inside the building, flush - 100 gallons if needed	
21	Quarzo Hot Thermal	from valve box outside building or before RPZ right inside the building, reach min 135F and maintain for a min of 5 minutes	
22	Superior Hot Thermal	from valve box outside building or before RPZ right inside the building, reach min 135F and maintain for a min of 5 minutes	
23	Any additional jug - public access to drinking thermal water? (H2O?)	Sample closest to the constant overflow line, reach min 135F and maintain for a min of 5 minutes	There should be no access to cool thermal water for public access to drink
24	Hot Cooled Thermal	from valve box outside building or before RPZ right inside the building, flush - 100 gallons if needed	
25	Hot Hot Thermal	from valve box outside building or before RPZ right inside the building, reach min 130F and maintain for a min of 5 minutes	Flush and see this takes heating and sampling location
26	Hot Hot Thermal furthest room to left on parking upstairs	from valve box outside building or before RPZ right inside the building, reach min 135F and maintain for a min of 5 minutes	
27	Hot Cooled Thermal furthest room to left on parking upstairs	from valve box outside building or before RPZ right inside the building, flush - 100 gallons if needed	
28	Hot Hot Thermal furthest room to the right on parking upstairs	from valve box outside building or before RPZ right inside the building, reach min 130F and maintain for a min of 5 minutes	
29	Hot Cooled Thermal furthest room to the right on parking upstairs	from valve box outside building or before RPZ right inside the building, flush - 100 gallons if needed	
30	Hot Hot Thermal furthest room to the right on parking main level	from valve box outside building or before RPZ right inside the building, reach min 130F and maintain for a min of 5 minutes	
31	Hot Cooled Thermal furthest room to the right on parking main level	from valve box outside building or before RPZ right inside the building, flush - 100 gallons if needed	
32	At Cooling Water Valve Chamber 6" line to Amphitheater	tap line and flush for - 1 minute in sample if possible	
33	At Cooling Water Valve Chamber 2" line to H2O?	tap line and flush for - 1 minute to sample if possible	
34	At Cooling Water Valve Chamber 2" line to H2O?	tap line and flush for - 1 minute to sample if possible	
35	Admin Basement Hot Water Header to table on all 12 drinking	As close to the end of the header as possible. Flush to reach min 135F and maintain for a min of 5 minutes	
36	Admin Basement Hot Water Header to table on all 12 drinking	As close to the end of the header as possible. Flush to reach min 135F and maintain for a min of 5 minutes	
37	Cooled Reservoir Cold Water Header to table on all 12 drinking	As close to the end of the header as possible. Flush to reach min 135F and maintain for a min of 5 minutes to try to get a sample of the system	Please note what buildings this serves and any dead end lines on it. All valves closed to unused fixtures?
38	Cooled Reservoir Cold Water Header to table on all 12 drinking	As close to the end of the header as possible. Flush to reach min 135F and maintain for a min of 5 minutes to try to get a sample of the system	
39	Any other lines key on the cooled and hot thermal water systems?	flush times as needed to get a representation of the water	
40			
41			
42			
43			
44			
45			
46			
47			

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Sent: 18 Sep 2019 14:07:03 +0000
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: FW: Hot Springs and Water management plans

Hey Troy... what do you think about this call? Do you want to shoot for the week of the 30th when you'll be back in the office? Given the ASHRAE angle I think we should invite Jasen and Claressa, too... plus she may be able to speak to some of the ecological questions.

From: Said, Maria <maria_said@nps.gov>
Sent: Wednesday, September 18, 2019 9:22 AM
To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Subject: Hot Springs and Water management plans

Hi Laura, Jessica, and Troy,

We (NPS and Arkansas) are trying to figure out the best path forward with the Hot Springs legionella cases. As you know, all the environmental testing has been negative. However, we have had a number of travel-related cases, and, based on Arkansas state data, it looks like there might be increased cases in the Hot Springs area generally compared to the rest of the state -- although these data are still being analyzed, and I would leave it to Arkansas to confirm this.

We also have considered more where the hot spring water is going -- apparently, it does not just go to the Quapaw, but it goes to a number of other concession operated businesses (including another spa) as well businesses outside park property (including a hospital therapeutic pool and at least one other hotel). One action we are considering is sending a letter to those who receive spa water and basically recommending that although we have never identified legionella in the water and don't know of any increased risk, we do know that untreated water does pose a risk for legionella growth, and businesses might want to consider a water management plan. My feeling is that it would be beneficial to them, if we have an additional case, to then be able to clearly describe their water system and the results of some pre-determined parameters (such as temperatures) over time.

If you all are available at any time, I would love to get your thoughts. Some questions I have are:

- Is a water management plan appropriate even for those buildings that don't meet ASHRAE building guidance criteria?
- Is a water management plan needed for only places that don't disinfect? I know that water management plans are used by many systems in which chlorine is used, but in this case, in which we don't have any evidence of Legionella growth in the hot spring water, I don't think we can or should point to hot spring water as a particular Legionella risk -- the risk in my mind is just from the fact that it is not disinfected.
- Should any of the water management plans include legionella testing? I think the Quapaw might consider this -- but then what would be the guidance if they get positive results?

I am including Allison, the new EIS officer for Arkansas on the thread. Dirk Haselow is no longer with the state health department.

Thanks for any thoughts on this. Hope you guys are well.

Maria

From: Kesteloot, Kurt
Sent: 10 Jul 2019 19:25:41 -0500
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: Fwd: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis
CDC49130
Attachments: AR2019Jul10_49130.pdf

Good Evening Troy,

Are you available for a call? Early tomorrow morning is best for me.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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----- Forwarded message -----

From: **Said, Maria** <maria_said@nps.gov>
Date: Wed, Jul 10, 2019 at 6:03 PM
Subject: Fwd: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis
CDC49130
To: Cooley, Laura A. (CDC/OID/NCIRD) <whz3@cdc.gov>
Cc: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Hi Laura,

Are you available to discuss this? I'm around tonight and early tomorrow morning - I'll be in clinic from 8:30am-12:30pm tomorrow but free after that.

Thank you!
Maria

----- Forwarded message -----

From: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Date: Wed, Jul 10, 2019 at 5:26 PM
Subject: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130
To: Brandi.Stricklin@arkansas.gov <Brandi.Stricklin@arkansas.gov>, CATHERINE.WATERS@ARKANSAS.GOV <CATHERINE.WATERS@arkansas.gov>, Debbie.Pledger@arkansas.gov <Debbie.Pledger@arkansas.gov>, Haselow, Dirk (CDC arkansas.gov) <dirk.haselow@arkansas.gov>, Wheeler, Gary (CDC arkansas.gov) <gary.wheeler@arkansas.gov>, Safi, Haytham (CDC arkansas.gov) <haytham.safi@arkansas.gov>, Michael.Cima@arkansas.gov <Michael.Cima@arkansas.gov>
Cc: NCID DBMD Travel-Legionella (CDC) <travellegionella@cdc.gov>, maria_said@nps.gov <maria_said@nps.gov>

Dear Colleague(s):

Please see the attached notification regarding a case of Legionnaires' disease that may be travel-associated. This patient had exposure to the Quapaw Baths & Spa. We are aware of 2 additional cases with exposure to this location within the past year (b)(6)

(b)(6). I have requested MS to obtain the lower respiratory specimen, if available.

Please see below for hot tub guidance:

Hot tub guidance:

- CDC webpage for water system maintenance and operating public hot tubs:
<http://www.cdc.gov/legionella/water-system-maintenance.html>
- CDC fact sheet for disinfecting hot tubs containing *Legionella*:
<http://www.cdc.gov/legionella/downloads/hot-tub-disinfection.pdf>
- Hot tub maintenance fact sheet:
<http://www.cdc.gov/healthywater/pdf/swimming/resources/operating-public-hot-tubs-factsheet.pdf>

Thanks,
Sooji

—
Sooji Lee, MS, MSPH

Epidemiologist (IHRC, Inc.)

Legionella Team (NCIRD/DBD/RDB)

Centers for Disease Control and Prevention

1600 Clifton Road, MS 1177-b | Atlanta, GA 30329

Phone: 404-718-3192 | Email: slee7@cdc.gov

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Maria Said, MD, MHS | CDR, U.S. Public Health Service

Epidemiology Branch Chief | Office of Public Health | National Park Service

Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240

Office Tel: 202-513-7151 | Email: maria_said@nps.gov

Website (public): <https://www.nps.gov/orgs/1878/index.htm>

Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

CONFIDENTIAL

To: ARKANSAS DEPARTMENT OF HEALTH, Brandi Stricklin, Brandi.Stricklin@arkansas.gov
ARKANSAS DEPARTMENT OF HEALTH, CATHERINE WATERS, CATHERINE.WATERS@ARKANSAS.GOV
ARKANSAS DEPARTMENT OF HEALTH, DEBBIE PLEDGER, Debbie.Pledger@arkansas.gov
ARKANSAS DEPARTMENT OF HEALTH, DIRK HASELOW, Dirk.Haselow@arkansas.gov
ARKANSAS DEPARTMENT OF HEALTH, GARY WHEELER, gary.wheeler@arkansas.gov
ARKANSAS DEPARTMENT OF HEALTH, HAYTHAM SAFI, haytham.safi@arkansas.gov
ARKANSAS DEPARTMENT OF HEALTH, MIKE CIMA, Michael.Cima@arkansas.gov

From: Sooji Lee, MPH, Centers for Disease Control and Prevention, Atlanta, Georgia, USA

Re: Travel-associated legionellosis CDC49130

Dear Colleague(s):

The Centers for Disease Control and Prevention has been informed of a suspect case of Legionnaires' disease in a female resident of MS (CDC49130) whose illness may be associated with travel away from home. The reported date of onset was 6/22/2019 and the patient has died. Legionnaires' disease was diagnosed by nucleic acid assay.

Hotel: AIRBNB RENTAL, Room: ---

Address: 112 CATALINA CIRCLE, HOT SPRINGS NATIONAL PARK, AR 71913 USA

Check-in: 6/12/2019 Check-out: 6/15/2019

Comments: STAYED AT CATALINA COVE BUILDING C, UNIT 1. PATIENT WENT TO QUAPAW BATH AND SPA AND HAD AN AROMA THERAPY HOT BATH ON 6/12/2019.

The patient reported spending time in or near a whirlpool spa during the 10 days before disease onset. Location: QUAPAW BATH & SPA, Dates: 6/12/2019

This case may be associated with the following known outbreak or possible cluster: QUAPAW SPA (2018-059).

This case was reported to CDC on 7/10/2019 by the MS DOH. More information may be available from:

Sooji Lee, MPH
Respiratory Diseases Branch
Centers for Disease Control and Prevention
Phone: 404-718-3192
Email: npf3@cdc.gov

This notification does not imply that the accommodation named is the source of the infection.

From: Kramer, Adam (CDC/ONDIEH/NCEH)
Sent: 24 Aug 2018 09:15:24 -0400
To: Kunz, Jasen M. (CDC/ONDIEH/NCEH); Ritter, Troy (CDC/ONDIEH/NCEH)
Subject: Fwd: [EXTERNAL] Fwd: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

Hi Jasen and Troy,

Would one of you be able to give Kurt a call? He'd like to discuss with you their plan and the rationale for the water system. Kurt, is the team lead over water/wastewater issues (if they still have it broken up that way) and used to cover Hot Springs so he is familiar with the water distribution system.

He was also a former IHS engineer before coming to NPS.

Thank you,

Adam

From: "Kesteloot, Kurt" <kurt_kesteloot@nps.gov>
Sent: Thursday, August 23, 2018 4:00 PM
To: "Kramer, Adam (CDC/ONDIEH/NCEH)" <ank5@cdc.gov>
Subject: Re: [EXTERNAL] Fwd: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

Hi Adam,

Great to hear from you. Thanks for thinking of me. We just found out from the park yesterday.

Here is where we are at...

Good Afternoon,

We had a great discussion at noon today with Dr. Said, HOSP Management, and etc. Thank you to LCDR Kostamo for on the ground work and CDR Maria Said for further research.

We cannot confirm that Legionella was transmitted at HOSP Quawpaw. We cannot confirm if or where it happened at HOSP. There are many potential locations where a legionella environment could occur in the Park and nearby. With research from Dr. Said, it is advised that we do not do environmental testing until we have a cluster of cases. If we find out about another case, we will be able to ask more questions to determine if they are linked and where it may have happened.

Meanwhile, the NPS OPH will continue to work with HOSP on minimizing risk for Legionella and other recreational water concerns. I recommended testing for the Quapaw in May of this year and they were given 60

days to comply. We are now at 90 days and the Park is assisting them to help conduct recommended pool/spa water quality testing.

OPII will also be talking to the Park more about disinfecting the thermal water at HOSP. Currently the water temperature ranges from 143 degrees Fahrenheit to 146 degrees Fahrenheit (F). The food code requires food to be held at 135F. Thus, the park has been operating under the requirement that all thermal water that is potable must leave the spigots at 135F. There are several other areas where visitors can be exposed to aerosolized water that is non potable. We are talking about providing disinfection for those waters to help reduce risk of Legionella. It is also important to note this is the only confirmed case of Legionnaire that we have heard about for HOSP since 2010.

I will update as we find out more information and welcome any questions, comments, or concerns.

Thank You and Very Respectfully,

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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Attention Federal Employees Only: Please let us know how we are doing by completing a survey found at: <https://www.surveymonkey.com/s/NPS-OPII-CustServ>

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On Thu, Aug 23, 2018 at 3:14 PM, Kramer, Adam (CDC/ONDIEH/NCEH)

<ank5@cdc.gov> wrote:

FYI

From: "EPIX Update (CDC)" <epixupdate@cdc.gov>

Sent: Thursday, August 23, 2018 2:52 PM

To:

Subject: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs

National Park — Arkansas, 2018



Check Epi-X for an Important Report

Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

The National Park Service (NPS) Office of Public Health is aware of a case of Legionnaires' disease associated with a visit to Hot Springs National Park in July 2018.

<https://epix2.cdc.gov/v2/Reports/Display.aspx?id=66780>

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From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 16 Jul 2019 01:49:15 +0000
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Cooley, Laura A. (CDC/DDID/NCIRD/DBD);Smith, Jessica (CDC/DDID/NCIRD/DBD)
Cc: Hubbard, Brian C. (CDC/DDNID/NCEH/DEHSP)
Subject: Fwd: HOSP-Legionella-Quapaw Update July 15, 2019

Hey LD Team! I didn't see any of you copied on Kurt's email below.

Troy

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From: Patricia Trap <patricia_trap@nps.gov>
Sent: Monday, July 15, 2019 9:01 PM
To: Kesteloot, Kurt
Cc: Said, Maria; Lauren Miller; Mark Scott; jhenry@atokainc.com; croberts@atokainc.com; Justin Cully; Terry.Paul@arkansas.gov; Richard.McMullen@arkansas.gov; Sara Newman; Gwendolyn Ruppert; Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Alexandra Picavet; Robert Kammel; Clara Wooden
Subject: Re: HOSP-Legionella-Quapaw Update July 15, 2019

Thanks Kurt for this report and diligence in testing. Let me know if you need anything.

Patty

Regional Director (Acting)
Midwest Region, National Park Service
office: 402-661-1520
cell: 402-637-2414

On Jul 15, 2019, at 7:37 PM, Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:

Good Evening Everyone,

Thanks for the assistance today! We took several bulk and swab samples in the Quapaw today. We hope to meet tomorrow around 0900 at the Hot Springs Nation Park Headquarters building.

Here is a brief of some of the testing conducted and proposed.

Testing conducted:

Quapaw:

Main Level:

Single Bath Use Area (Room F and G) likely Person 1 and Person 2 rooms for latest scenario.

Room F: Bulk mixed sample of tempered and thermal water (~104.8F) and swab in the jets.

Room G: Bulk thermal sample (~137F), bulk tempered sample (~94F), swab jets and micro bubbles emitter, and remove jet and swab.

Left Pool: Bulk and Swab

Center Pool: Bulk and Swab

Right Pool: Bulk and Swab

Upper Pool:

Shower Heads: Bulk and Swab

Basement:

Shower next to the only individual basement tub that has a skylight (~107F) bulk sample and swab.

Hatch area outside of the cave: excesses waste thermal water in large reservoir (~133F). A bulk sample was taken and two swabs were taken.

Basement Water cascade wall fountain. Occasionally disinfected and was disinfected last week. It uses city water and had a temp of ~74F.

Basement Cave: I was not present but think it was just swabbed.

Please note: the temperatures and samples collected are from memory and the lab recorded the actual numbers. There were approximately 12 swabs may have been gathered along with about 9 bulk samples.

Proposed Testing:

Fountains: Approximately 5 or 6 bulk and swabs

Cooling Tower: Bulk of mixed water (from both towers) and swab of both towers

Tempered (cold) thermal: Cold water at the tank and likely in the Quapaw (Bulk and Swab)

Thermal Water: HQ tank and upper tank (Bulk and Swab)

Quapaw: Swab duct-work in the main bathing area and possibly individual baths area.

Estimated samples remaining are: 11 bulk and 14 swabs.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS

Supervisory Public Health Consultant, Midwest Region

National Park Service, Office of Public Health (OPH),

601 Riverfront Drive

Omaha, NE 68102

Office Phone: 1-402-661-1718

Office Fax: 1-402-661-1719

Cell Phone: 1-202-641-0055

Email: Kurt_Kestcloot@nps.gov

x]

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On Fri, Jul 12, 2019 at 3:22 PM Said, Maria <maria_said@nps.gov> wrote:

Situation

- We know of 3 cases of confirmed or suspect Legionnaires' disease associated with Quapaw Bath and Spa, with dates of onset in July 2018, November 2019, and June 2019. The most recent case was unfortunately a death.
- A collaborative team including HOSP, the NPS OPH, and Arkansas Department of Health, all in consultation with the CDC, is working on the public health response to this cluster/outbreak.
- Environmental sampling is planned for early next week.

Updates for July 12, 2019

- Kurt put together a draft sampling plan, a presentation showing photos of the park, and a detailed map of the park for discussion with Troy of CDC and Terry of Arkansas.
- We had call with Quapaw and communicated that (1) we had a third case that was a fatality; (2) we plan additional environmental testing; (2) guest notifications are needed going back one month; (3) clearly visible notifications of all current spa visitors are needed until environmental testing results are back (otherwise the

spa would have to close until we have results); (4) we need documentation of the numbers of guests identified with visits over the last month and how many have been reached with notifications; (5) the spa should not change operations in any way or alert employees, so that when we do testing, we get as representative a sample as possible; (6) Dirk Haselow (state epi for Arkansas) and I will need to see and approve the guest notifications and signage for current visitors.

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- Dirk Haselow (state epi for Arkansas) and I have reviewed drafts of the Guest Notification Letter to previous guests as well as the notifications that will go to current visitors. We have also provided a link to the CDC fact sheet for distribution. The owners expressed that they will can start informing current guests through their sign-in process as early as today.

Please let me know of any edits or additions to this summary.

Maria

From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 17 Jul 2019 12:41:01 +0000
To: Smith, Jessica (CDC/DDID/NCIRD/DBD); Cooley, Laura A.
(CDC/DDID/NCIRD/DBD)
Cc: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: Fwd: Quapaw Operation Recommendations for the Next 10-14 Days
and Environmental Testing Conducted

Morning Laura and Jess,

I'm forwarding Kurt's remediation suggestions. Looking forward to this morning's calls.

Troy

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From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, July 17, 2019 2:44 AM
To: Miller, Laura; Mark Scott
Cc: Sara Newman; Said, Maria; Robert Kammel; Terry.Paul@arkansas.gov;
Richard.McMullen@arkansas.gov; Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: Quapaw Operation Recommendations for the Next 10-14 Days and Environmental
Testing Conducted

Good Evening Mark and Laura,

Sorry this is so late. I was trying to work on some reports from last week and lost track of time. After further investigation, the Quapaw has approximately 8 individual baths. Seven (rooms A-G?) of those baths are on the main floor in a separate room adjacent to the four large bathing pools. The eighth bath is in the basement.

The following are recommendations for operations at the Quapaw for the next 10-14 days (until we receive lab results). After we have more data there may be other recommended changes.

1. Cease use of the "new" MicroSilk® hydrotherapy. The process results in water droplets.
2. Ensure the entire bath, jets, plumbing and Microsilks system is disinfected between each use. One option would be to add 8 ounces of bleach (6.25% NaOH solution) to a tub that is full above the jets and Microsilks port. The 8 ounces of bleach (NSF approved recommended) can be added to the water from the previous user. This should result in a superchlorinate solution of about 40 ppm of chlorine if there are about 100 gallons of water in the tub. At this concentration it is recommended that the superchlorinated water be circulated through the bath, jets, Microsilks system, and plumbing for approximately 5 minutes. Attendants should not be near the pool during this time and it would be best to leave the room and shut the door. After the time has passed the attendant could carefully enter the room turn off any pumps or circulation devices in the tub and leave the room for another few minutes. After that, the attendant could return and drain the tub and then fill for the next use. That said, it is not recommended that the tubs be filled more than ~30 minutes before each use or a time where the customer is not in water that is more than 2 hours old when they leave the tub. If the facility has a process that they believe is effective or has questions about this, please do not hesitate to call.
3. Work with Arkansas Department of Health (ADH) and the NPS Office of Public Health (OPH) on adjusting the pH in the four main bathing pools to help reduce chlorine usage and help ensure free chlorine residuals stay above 1.0 mg/L during high bather loading times. It is recommended that the chlorine residuals continue to be taken three times a day. However, they should be taken from the pools above versus the filter below. A couple of testing devices were recommended in the March report emailed in April of this year. The ADH had a BioGuard 1200-V multi-test kit that is fairly accurate and easy to operate. It is recommended that the facility purchase a similarly accurate device that

tests a minimum of free chlorine, total chlorine, and pII as soon as possible. Please contact the ADII and OPII if there are questions and provide daily emails of pII and chlorine residuals.

4. Follow the link below and commence work on a Water Management Plan. The ADH and OPH would be happy to answer any questions. Please email both of us with any and all questions. Also, if any major risks come up while completing this Water Management Plan, please notify OPH at once.

Water Management Plan Link: <https://www.cdc.gov/legionella/wmp/toolkit/index.html>

If I missed something, we can discuss tomorrow.

The following samples were collected over the last two days.

Samples Collected:

Quapaw:

Main Level:

Single Bath Use Area (Room F and G) likely Person 1 and Person 2 rooms for latest scenario.

Room F: Bulk mixed sample of tempered and thermal water (~104.8F) and swab in the jets.

Room G: Bulk thermal sample (~137F), bulk tempered sample (~94F), swab jets and micro bubbles emitter, and remove jet and swab.

Left Pool: Bulk and Swab

Center Pool: Bulk and Swab

Right Pool: Bulk and Swab

Upper Pool:

Shower Heads: Bulk and Swab

Basement:

Shower next to the only individual basement tub that has a skylight (~107F) bulk sample and swab.

Hatch area outside of the cave: excesses waste thermal water in large reservoir (~133F). A bulk sample was taken and two swabs were taken.

Basement Water cascade wall fountain. Occasionally disinfected and was disinfected last week. It uses city water and had a temp of ~74F.

Basement Cave: I was not present but think it was just swabbed.

Please note: the temperatures and samples collected are from memory and the lab recorded the actual numbers. There were approximately 12 swabs may have been gathered along with about 9 bulk samples.

Fountains:

Display, Nobel, Cascade, and Two on bathhouse row. The state is going to talk to the City about testing a fountain immediately adjacent to the parking garage and possibly others.

Cooling Tower:

Bulk water from both towers. There are no condensation basins and no condensation was present. Since the water is only tempered down to ~90 degrees Fahrenheit moisture has not been visible.

Tempered (cold) thermal:

Bulk cold water at the Quapaw

Thermal Water:

Bulk hot water at the HQ collection box and the Quapaw

Quapaw:

Swabbed basement floor where there was standing water close to basement air intake and some building duct-work. Swabbed duct-work in the main bathing area and took bacteriological samples of the four pools. Chlorine and pH were also tested onsite for the four pools.

I think that covers most of the tests taken. I was not present for all and may have missed one or two.

Thank you to everyone who assisted and please share this message as needed. I hope to make the meeting tomorrow but will be in the field at BUFF with limited cell phone

service at times. There is much more to talk about, such as plans for different scenarios, etc. However, I think we should all talk about that on the phone first.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

From: Kesteloot, Kurt
Sent: 15 Jul 2019 19:37:18 -0500
To: Said, Maria;Lauren Miller;Mark
Scott;jhenry@atokainc.com;croberts@atokainc.com;Justin
Cully;Terry.Paul@arkansas.gov;Richard.McMullen@arkansas.gov
Cc: Sara Newman;Gwendolyn Ruppert;Ritter, Troy
(CDC/DDNID/NCEH/DEHSP);Alexandra Picavet;Patricia Trap;Robert Kammel;Clara Wooden
Subject: HOSP-Legionella-Quapaw Update July 15, 2019

Good Evening Everyone,

Thanks for the assistance today! We took several bulk and swab samples in the Quapaw today. We hope to meet tomorrow around 0900 at the Hot Springs Nation Park Headquarters building.

Here is a brief of some of the testing conducted and proposed.

Testing conducted:

Quapaw:

Main Level:

Single Bath Use Area (Room F and G) likely Person 1 and Person 2 rooms for latest scenario.

Room F: Bulk mixed sample of tempered and thermal water (~104.8F) and swab in the jets.

Room G: Bulk thermal sample (~137F), bulk tempered sample (~94F), swab jets and micro bubbles emitter, and remove jet and swab.

Left Pool: Bulk and Swab

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Shower next to the only individual basement tub that has a skylight (~107F) bulk sample and swab.

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A bulk sample was taken and two swabs were taken.

Basement Water cascade wall fountain. Occasionally disinfected and was disinfected last week. It uses city water and had a temp of ~74F.

Basement Cave: I was not present but think it was just swabbed.

Please note: the temperatures and samples collected are from memory and the lab recorded the actual numbers. There were approximately 12 swabs may have been gathered along with about 9 bulk samples.

Proposed Testing:

Fountains: Approximately 5 or 6 bulk and swabs

Cooling Tower: Bulk of mixed water (from both towers) and swab of both towers
Tempered (cold) thermal: Cold water at the tank and likely in the Quapaw (Bulk and Swab)

Thermal Water: HQ tank and upper tank (Bulk and Swab)

Quapaw: Swab duct-work in the main bathing area and possibly individual baths area.

Estimated samples remaining are: 11 bulk and 14 swabs.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

On Fri, Jul 12, 2019 at 3:22 PM Said, Maria <maria_said@nps.gov> wrote:
Situation

- We know of 3 cases of confirmed or suspect Legionnaires' disease associated with Quapaw Bath and Spa, with dates of onset in July 2018, November 2019, and June 2019. The most recent case was unfortunately a death.
- A collaborative team including HOSP, the NPS OPH, and Arkansas Department of Health, all in consultation with the CDC, is working on the public health response to this cluster/outbreak.
- Environmental sampling is planned for early next week.

Updates for July 12, 2019

- Kurt put together a draft sampling plan, a presentation showing photos of the park, and a detailed map of the park for discussion with Troy of CDC and Terry of Arkansas.

- We had call with Quapaw and communicated that (1) we had a third case that was a fatality; (2) we plan additional environmental testing; (3) guest notifications are needed going back one month; (4) clearly visible notifications of all current spa visitors are needed until environmental testing results are back (otherwise the spa would have to close until we have results); (5) we need documentation of the numbers of guests identified with visits over the last month and how many have been reached with notifications; (6) the spa should not change operations in any way or alert employees, so that when we do testing, we get as representative a sample as possible; (7) Dirk Haselow (state epi for Arkansas) and I will need to see and approve the guest notifications and signage for current visitors.
- The Quapaw expressed understanding and agreement with the plan. Later they phoned and asked if people who only came in for massage should be notified as well, and I confirmed with them that all guests, including for massage, should be notified.
- Dirk Haselow (state epi for Arkansas) and I have reviewed drafts of the Guest Notification Letter to previous guests as well as the notifications that will go to current visitors. We have also provided a link to the CDC fact sheet for distribution. The owners expressed that they will can start informing current guests through their sign-in process as early as today.

Please let me know of any edits or additions to this summary.

Maria

From: Said, Maria
Sent: 7 Oct 2019 10:43:16 -0400
To: Smith, Jessica (CDC/DDID/NCIRD/DBD); Lucas, Claressa (CDC/DDID/NCIRD/DBD); Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR); Kunz, Jason M. (CDC/DDNID/NCEH/DEHSP)
Cc: Laura Miller; Kesteloot, Kurt; Sara Newman
Subject: Hot Springs - PCR results
Attachments: 2019-10-04 - Arkansas Dept. Of Health - Summary.pdf, HOSP Thermal Water Sampling Plan 10-4-19.pdf

Hi all,

We have received PCR results from the most recent environmental sampling at Hot Springs National Park. I am attaching the results, as well as a schematic of the water system and where samples were drawn.

Would you all be available today to help us understand these results? I do have some specific questions as well.

- I understand that PCR positivity indicates only Legionella genetic material, that it may be viable or not, and that we need to wait for culture results -- but can it also just be a false positive (i.e. identify genetic material from a different organism)?
- Should PCR positivity in the absence of positive culture push us toward any public health action or is it really just culture information that we would act on? Our understanding is that we a relatively PPV, we just need to wait for culture results but would love to hear your perspective as well.
- What are we to make of the positives in the HOT system (marked as red on the sampling plan), particularly if they are also culture positive? Are there data from Japan on the survival/presence of Legionella at temperatures higher than one would expect?
- Assuming that all these PCR positives are culture positive also, how do we view the overall risk of the water system? My understanding is that these positives are in relatively isolated areas in which amplification might not be a surprise.
- Any other overall thoughts they have on directions we should take, based on the information we have at this time?

Thanks very much - as always.
Maria



PHIGENICS ANALYTICAL SERVICES LABORATORY
 Phone: 844-850-4087
 www.phigenics.com
 CDC ELITE Certified

Facility Tested: Arkansas Department Of Health
Date of Testing: 2019/10/04
Contact Email: dostrand@phigenics.com

Validation Criteria:
Potable Water - typically in well managed systems, the total viable heterotrophic aerobic bacterial concentration should be less than or equal to 10⁵ CFU/mL. Per the OSHA Legionella Technical Manual, the viable Legionella concentration should be less than 10 CFU/mL unless the water system serves immunocompromised or higher risk users which require a more stringent level of Legionella control (less than 1 CFU/mL).
Utility Water (such as cooling water) - typically in well managed systems, the total viable heterotrophic aerobic bacterial concentration should be less than or equal to 10⁶ CFU/mL. For closed recirculating utility water, the total viable heterotrophic aerobic bacterial concentration should be less than or equal to 10⁵ CFU/mL. Per the OSHA Legionella Technical Manual, the viable Legionella concentration should be less than 10 CFU/mL.
 The facility **Water Management Team** should review all options for Validation Criteria and choose its specific criteria based on the specific systems and users.

Phigenics Validation Test PREMIUM Report Summary

Method Used: Next Day Legionella PCR™, TimeZero™, and Standard ISO 11731 Spread Plate

Legionella Caution	<input type="checkbox"/>	Indicates Legionella was detected.
THAB Caution	<input type="checkbox"/>	Indicates total heterotrophic bacteria count exceeds the validation criteria (10 ⁵ for potable, 10 ⁶ for utility, 10 ⁷ for closed recirculating utility).
NO Concern	<input type="checkbox"/> No Shading	Indicates results are better than the validation criteria.
	<input type="checkbox"/> ND	Indicates Legionella was not detected.
	<input type="checkbox"/> P	Indicates results are pending.

PASL Number	Date Inoculated	Date Analyzed	Collector	Location Identification	Category (Potable/Utility)	Molecular Marker Negative Screen	Total Bacteria	TimeZero™			Standard ISO		
								Lpn S1	Lpn S2-14	Legionella Spp	Lpn S1	Lpn S2-14	Legionella Spp
CFU/mL													
349637	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Admin Display Fountain	Potable	Detected	P	P	P	P	P	P	P
349638	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Nobel Fountain	Potable	Not Detected	P	P	P	P	P	P	P
349639	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Lamar Hot	Potable	Not Detected	P	P	P	P	P	P	P
349640	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Buckstaff 4th Tub On The Right Hot	Potable	Not Detected	P	P	P	P	P	P	P
349641	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Buckstaff 4th Tub On The Right Cold	Potable	Not Detected	P	P	P	P	P	P	P
349642	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Quapaw Hot	Potable	Not Detected	P	P	P	P	P	P	P
349643	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Quapaw Cold	Potable	Not Detected	P	P	P	P	P	P	P
349644	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health QE Ind. Tub Hot	Potable	Not Detected	P	P	P	P	P	P	P
349645	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health QE Ind. Tub Cold	Potable	Detected	P	P	P	P	P	P	P
349646	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Rm 207 Hale Hot	Potable	Detected	P	P	P	P	P	P	P
349647	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Rm 207 Hale Cold	Potable	Detected	P	P	P	P	P	P	P
349648	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Superior Hot	Potable	Not Detected	P	P	P	P	P	P	P
349649	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Rm 2 Arlington Hot	Potable	Detected	P	P	P	P	P	P	P
349650	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Rm 2 Arlington Cold	Potable	Detected	P	P	P	P	P	P	P
349651	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Levi Hospital Hot	Potable	Detected	P	P	P	P	P	P	P
349652	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Cooled Water Reservoir Cold	Potable	Not Detected	P	P	P	P	P	P	P
349653	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Libby Jug Fountain Hot	Potable	Not Detected	P	P	P	P	P	P	P
349654	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Shell Fountain Hot	Potable	Not Detected	P	P	P	P	P	P	P
349655	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Display Spring Behind Maurice	Utility	Detected	P	P	P	P	P	P	P
349656	2019/10/04	2019/10/05	D. Ostrand	AR Dept. Of Health Cascade	Potable	Detected	P	P	P	P	P	P	P

phigenics
 Disclaimer: Results from the PVT, or from any other analytical protocol for that matter, do not necessarily provide enough evidence to ensure that hazards from pathogenic microorganisms have been eliminated or controlled nor that risk of harm from such hazards has been reduced. Results from the PVT should only be interpreted within the context of properly designed and implemented water management programs. No guarantee regarding results is expressed or implied. THE PVT AND THE RESULTS IT PRODUCES ARE PROVIDED ON AN "AS IS" BASIS. YOU ASSUME TOTAL RESPONSIBILITY AND RISK FOR YOUR USE OF THE PVT AND PHIGENICS IS NEITHER RESPONSIBLE NOR LIABLE FOR ANY DAMAGES ARISING OUT OF YOUR USE OF THE PVT. This report shall not be reproduced except in full and with the written approval of the laboratory.

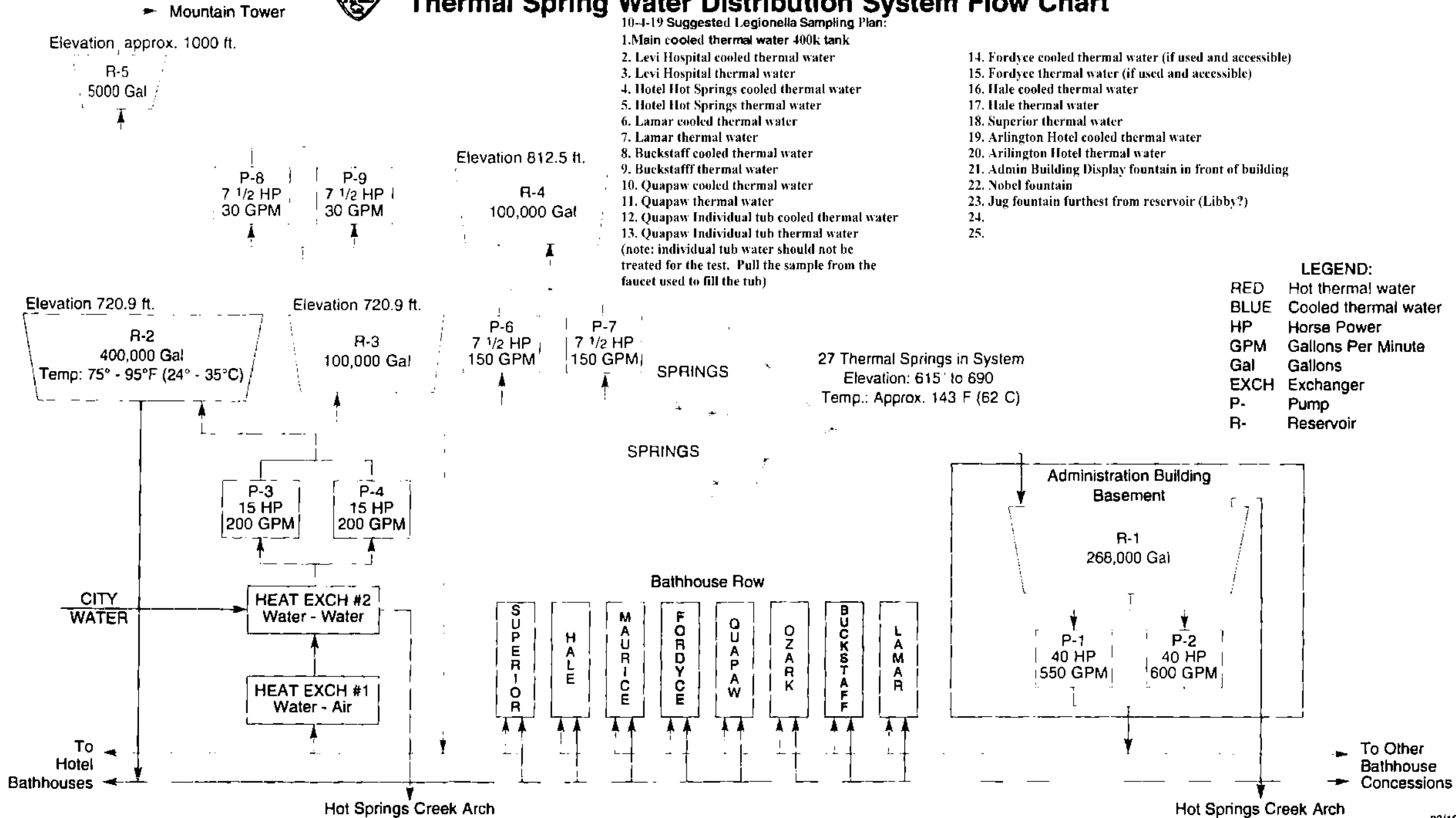


Hot Springs National Park

Thermal Spring Water Distribution System Flow Chart

10-4-19 Suggested Legionella Sampling Plan:

1. Main cooled thermal water 400k tank
2. Levi Hospital cooled thermal water
3. Levi Hospital thermal water
4. Hotel Hot Springs cooled thermal water
5. Hotel Hot Springs thermal water
6. Lamar cooled thermal water
7. Lamar thermal water
8. Buckstaff cooled thermal water
9. Buckstaff thermal water
10. Quapaw cooled thermal water
11. Quapaw thermal water
12. Quapaw Individual tub cooled thermal water
13. Quapaw Individual tub thermal water
(note: individual tub water should not be treated for the test. Pull the sample from the faucet used to fill the tub)
14. Fordyce cooled thermal water (if used and accessible)
15. Fordyce thermal water (if used and accessible)
16. Hale cooled thermal water
17. Hale thermal water
18. Superior thermal water
19. Arlington Hotel cooled thermal water
20. Arlington Hotel thermal water
21. Admin Building Display fountain in front of building
22. Nobel fountain
23. Jug fountain furthest from reservoir (Libby?)
- 24.
- 25.



THE THERMAL WATER DISTRIBUTION SYSTEM OF HOT SPRINGS NATIONAL PARK

Systems for distributing thermal spring water at Hot Springs National Park have been around a long time, evolving along with the bathhouses. In the first half of the nineteenth century most "bathhouses" were rough wooden shacks or even tents, built over natural tufa cavities (sometimes enlarged) that held spring water. More elaborate bathhouses began springing up in the 1850s. Some boasted individual bath rooms with wooden tubs, requiring a network of wooden troughs to direct thermal water into flumes on the roofs. Inside the bathhouse, bathers pulled a rope, opening a mechanism that released water from the flume into the tub.

When a disastrous 1878 fire destroyed most of the bathhouses along Hot Springs Creek, the government seized the opportunity to improve both bathhouse construction and thermal water distribution. The Avenue Hotel Bathhouse, built in 1880, was allowed to set up a pump on the reservation. The first reservoir was built in 1880 as well. On June 8, 1891, a pumping station and reservoir were completed on the present site of the administration building in order to enhance thermal water distribution. Unfortunately a law passed that same year required water to be transported by gravity flow, and the pumping equipment was never used.

The government built more reservoirs in the 1890s to impound spring water and increase the flow. In 1897 all but four springs were encased in brick archways and their water piped to bathhouses and reservoirs; the remaining springs were enclosed by 1901. On November 10, 1903, Congress authorized funds for building surface and deep reservoirs on Hot Springs Mountain, adding to the collection of older reservoirs already in use. In 1924 National Park Service engineers drew a plan showing the existing complex of springs, reservoirs, and plumbing in preparation for the first central collection, impounding and distribution system for the thermal water, completed around 1931. Meters installed on bathhouse lines were not fully functional until 1933. The present system allows better control and monitoring of the water flow.

The springs are located on about 2.8 acres along Bathhouse Row and the Grand Promenade. The bulk of the approximately 850,000 gallons of thermal water flowing each day from Hot Springs Mountain is collected from 27 of the 47

presently active springs. Each spring in the collection system has been sealed and covered with a green box about four feet square with a metal cover, chain, and padlock. The green boxes on the lower west slope of Hot Springs Mountain and the heat exchange units at the north end of Bathhouse Row are the most visible components of the thermal water distribution system and represent its source portion. Not all of the boxes indicate a spring; some hold only valves and collection plumbing. The boxes higher up on the mountain allow access to the underground reservoirs and plumbing.

The valve and spring collection boxes are connected with the plumbing system delivering thermal water to reservoir R-1 under the east end and parking lot of the administration building at the south end of Bathhouse Row. This reservoir holds about 268,000 gallons and includes an overflow pipe connected to the Hot Springs Creek arch.

In the administration building basement, two pumps (P-1 and P-2) move the thermal water through a twelve-inch cast-iron pipe in the Hot Springs Creek arch to the bathhouses, the heat exchangers, and a 100,000-gallon underground storage reservoir (R-3) about 120 feet above Bathhouse Row. The elevation of this reservoir ensures an ample supply of water at about 52 pounds per square inch (psi) when pumps P-1 and P-2 are idle. When demand increases, pumps P-6 and P-7 transfer thermal water from reservoir R-3 to another 100,000-gallon reservoir (R4) about 220 feet above Bathhouse Row. The plumbing for a number of bathhouses no longer in operation is still in the distribution system as well.

Surprisingly enough the water within the distribution system stays well above 100°F (37.8°C); the water has been flowing into it for decades, and the terrain around the reservoirs and plumbing is heat saturated. As a result, the water arriving at the bathhouses is far too hot for direct bathing. By the 1890s most of the bathhouses had individual cooling towers to cool down the thermal water. These and similar towers were used until the central thermal water cooling system was completed on February 8, 1950. The system is comprised of two heat exchangers (#1 and #2), two pumps (P-3 and P-4), and a 400,000-gallon reservoir (R-2). The first exchanger is a thermal water-to-air cooling unit that works like a car radiator; it contains a primary and secondary section,

each with a large fan to force air through its radiator cores. When both sections of heat exchanger #1 are unable to cool the water sufficiently, #2 comes on line. This exchanger runs cold city water over the tubes carrying the thermal water but never mixes with it. The city water, which is heated in the process, is discharged into the Hot Springs Creek arch, and pumps P-3 and P-4 move the cooled thermal water (still 100% spring water) into reservoir R-2. This reservoir is next to and at the same elevation as reservoir R-3, so an ample supply of cooled water is also available at about 52 psi. The system for delivering cooled thermal water is similar to the hot spring water distribution system.

By mixing hot and cooled spring water, attendants can administer baths at the temperature (98° to 100°F, 36.7° to 37.8°C) required by regulations. The system was designed to produce thermal water cooled to temperatures ranging from 75° to 90°F (24° to 32.2°C). During most of the year when outdoor temperatures are below 80°F (26.7°C), the system works well, but during the hot summer months the desired temperature range is difficult to achieve. To compensate, heat exchanger #2 has been redesigned, and installation of new equipment began in the first quarter of fiscal year 2001.

The entire system is monitored automatically from the basement of the park administration building. The quantity and temperature of the water coming in from the springs are recorded continuously for 24 hours a day, as are water levels in each reservoir. Meters at each bathhouse transmit readings on the amount of water used to the monitoring center. Analyses of these data alert maintenance workers to the possibility of major leaks or equipment failure.

One source of equipment failure is the buildup of calcium carbonate, or limestone, in the system. Similar to the water found in caves, the spring water contains dissolved limestone that can be deposited in pipes, valves, and other system components, particularly in those handling cooled spring water. Because calcium carbonate is less soluble in cold water, it settles out in greater quantities in cooled water systems. Also called "tufa," the deposit is left wherever the thermal springs flow. In fact, the porous gray tufa formations behind Bathhouse Row are really geological "maps" showing where the springs once flowed freely down the mountainside.

From: Said, Maria
Sent: 18 Sep 2019 09:22:04 -0400
To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD);Smith, Jessica (CDC/DDID/NCIRD/DBD);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);James, Allison (CDC arkansas.gov);Kesteloot, Kurt
Subject: Hot Springs and Water management plans

Hi Laura, Jessica, and Troy,

We (NPS and Arkansas) are trying to figure out the best path forward with the Hot Springs legionella cases. As you know, all the environmental testing has been negative. However, we have had a number of travel-related cases, and, based on Arkansas state data, it looks like there might be increased cases in the Hot Springs area generally compared to the rest of the state -- although these data are still being analyzed, and I would leave it to Arkansas to confirm this.

We also have considered more where the hot spring water is going -- apparently, it does not just go to the Quapaw, but it goes to a number of other concession operated businesses (including another spa) as well businesses outside park property (including a hospital therapeutic pool and at least one other hotel). One action we are considering is sending a letter to those who receive spa water and basically recommending that although we have never identified legionella in the water and don't know of any increased risk, we do know that untreated water does pose a risk for legionella growth, and businesses might want to consider a water management plan. My feeling is that it would be beneficial to them, if we have an additional case, to then be able to clearly describe their water system and the results of some pre-determined parameters (such as temperatures) over time.

If you all are available at any time, I would love to get your thoughts. Some questions I have are:

- Is a water management plan appropriate even for those buildings that don't meet ASHRAE building guidance criteria?
- Is a water management plan needed for only places that don't disinfect? I know that water management plans are used by many systems in which chlorine is used, but in this case, in which we don't have any evidence of Legionella growth in the hot spring water, I don't think we can or should point to hot spring water as a particular Legionella risk -- the risk in my mind is just from the fact that it is not disinfected.
- Should any of the water management plans include legionella testing? I think the Quapaw might consider this -- but then what would be the guidance if they get positive results?

I am including Allison, the new EIS officer for Arkansas on the thread. Dirk Haselow is no longer with the state health department.

Thanks for any thoughts on this. Hope you guys are well.
Maria

From: Google Calendar on behalf of maria_said@nps.gov
Sent: 17 Jul 2019 16:06:54 +0000
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP);terry.paul@arkansas.gov;Smith, Jessica (CDC/DDID/NCIRD/DBD);Haselow, Dirk (CDC arkansas.gov);kurt_kesteloot@nps.gov;catherine.waters@arkansas.gov;laura_a_miller@nps.gov
Subject: Invitation: Quapaw Legionella Discussion @ Fri Jul 19, 2019 11am - 12pm (EDT) (tir4@cdc.gov)
Attachments: invite.ics

You have been invited to the following event.

[more details »](#)

Quapaw Legionella Discussion

Fri Jul 19, 2019 11am – 12pm

Tel 1-866-723-8146 PC7713400 ([map](#))

https://hangouts.google.com/hangouts/_/doi.gov/aria-said

tir4@cdc.gov

- maria_said@nps.gov
- tir4@cdc.gov
- terry.paul@arkansas.gov
- lyd7@cdc.gov
- dirk.haselow@arkansas.gov
- kurt_kesteloot@nps.gov
- catherine.waters@arkansas.gov
- laura_a_miller@nps.gov

[Yes](#) - [Maybe](#) - [No](#) [more options »](#)

[Google Calendar](#)

[Learn More](#)

From: Said, Maria
Sent: 1 Oct 2019 11:50:48 -0400
To: Lucas, Claressa (CDC/DDID/NCIRD/DBD);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Smith, Jessica (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Cc: Kesteloot, Kurt;Laura Miller;Terry Paul;James, Allison (CDC arkansas.gov);Richard McMullen, Ph.D.
Subject: Legionella - Quapaw
Attachments: HOSP Thermal Water Disinfect Tempered Water.pdf

Hi Claressa, Jasen, Troy, and Jessica,

We look forward to discussing water management plans this afternoon - but we will also received new information that I wanted to give you a heads-up on.

Arkansas recently pulled 4 samples -- one is hot water that feeds the park, two were fountains on city water, and one was a shower in the Quapaw that receives tempered thermal water. By report (although I haven't seen all the official reports), the fountains and the shower were PCR+, but only the shower was also culture positive (*L. pneumophila* serogroups 2-14 (3 CFU; 30 CFU/mL). A different lab than previous was used. We (the state, the park, and the NPS Office of Public Health) did speak this morning and have some tentative plans in place but would love to talk more with you.

Some questions (although there are likely others) include:

- Reviewing the one positive culture result and understanding more about the result (it was drawn in a way I have not heard of before)
- Understanding the significance of PCR+ and culture negative results

Moving forward, we are interested in additional testing (using this new lab) and developing a water management plan.

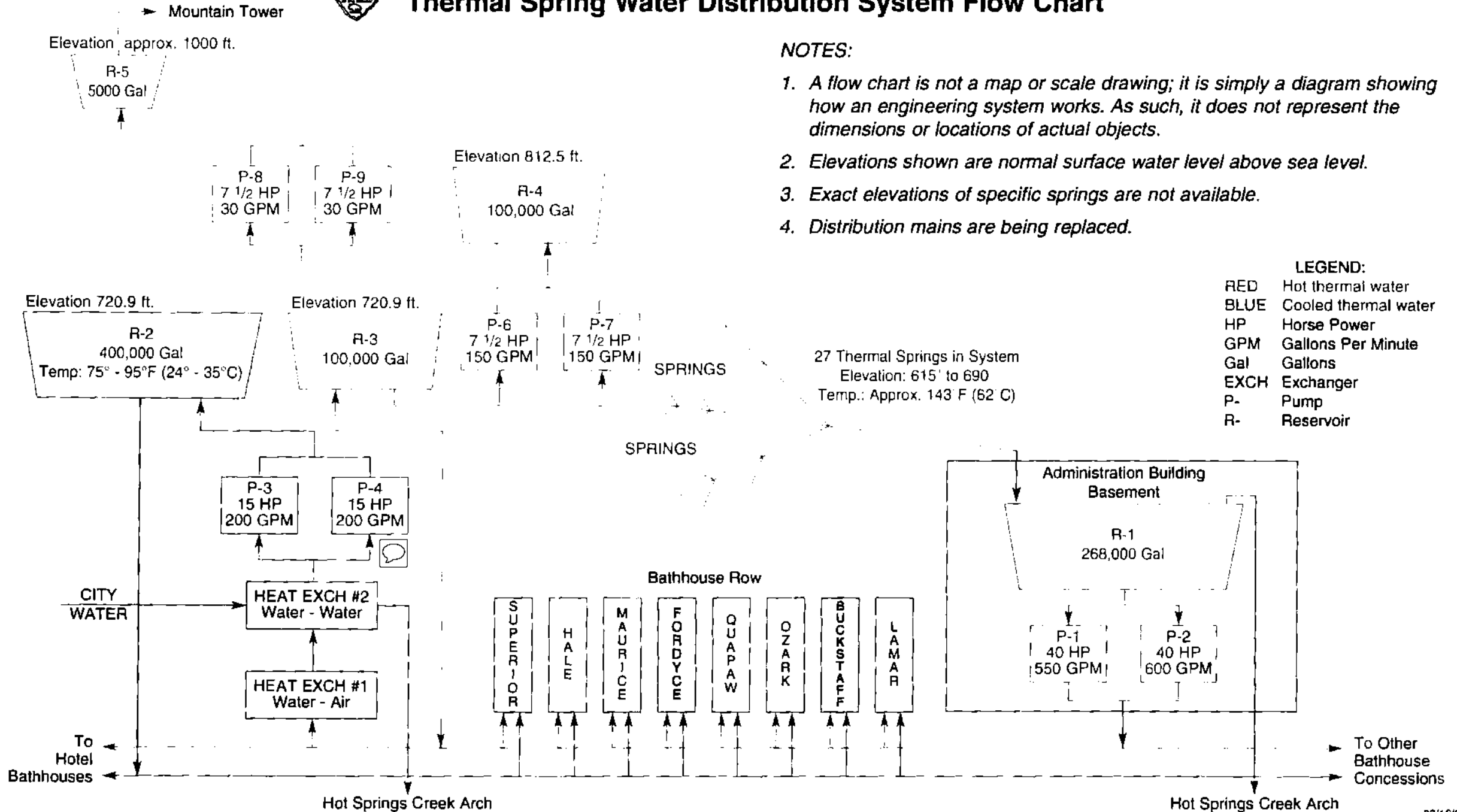
I'm also attaching a schematic of the water system, which is really helpful in understanding the hot vs. thermal water that feeds different buildings in the area.

Thanks.
Maria



Hot Springs National Park

Thermal Spring Water Distribution System Flow Chart



THE THERMAL WATER DISTRIBUTION SYSTEM OF HOT SPRINGS NATIONAL PARK

Systems for distributing thermal spring water at Hot Springs National Park have been around a long time, evolving along with the bathhouses. In the first half of the nineteenth century most "bathhouses" were rough wooden shacks or even tents, built over natural tufa cavities (sometimes enlarged) that held spring water. More elaborate bathhouses began springing up in the 1850s. Some boasted individual bath rooms with wooden tubs, requiring a network of wooden troughs to direct thermal water into flumes on the roofs. Inside the bathhouse, bathers pulled a rope, opening a mechanism that released water from the flume into the tub.

When a disastrous 1878 fire destroyed most of the bathhouses along Hot Springs Creek, the government seized the opportunity to improve both bathhouse construction and thermal water distribution. The Avenue Hotel Bathhouse, built in 1880, was allowed to set up a pump on the reservation. The first reservoir was built in 1880 as well. On June 8, 1891, a pumping station and reservoir were completed on the present site of the administration building in order to enhance thermal water distribution. Unfortunately a law passed that same year required water to be transported by gravity flow, and the pumping equipment was never used.

The government built more reservoirs in the 1890s to impound spring water and increase the flow. In 1897 all but four springs were encased in brick archways and their water piped to bathhouses and reservoirs; the remaining springs were enclosed by 1901. On November 10, 1903, Congress authorized funds for building surface and deep reservoirs on Hot Springs Mountain, adding to the collection of older reservoirs already in use. In 1924 National Park Service engineers drew a plan showing the existing complex of springs, reservoirs, and plumbing in preparation for the first central collection, impounding and distribution system for the thermal water, completed around 1931. Meters installed on bathhouse lines were not fully functional until 1933. The present system allows better control and monitoring of the water flow.

The springs are located on about 2.8 acres along Bathhouse Row and the Grand Promenade. The bulk of the approximately 850,000 gallons of thermal water flowing each day from Hot Springs Mountain is collected from 27 of the 47

presently active springs. Each spring in the collection system has been sealed and covered with a green box about four feet square with a metal cover, chain, and padlock. The green boxes on the lower west slope of Hot Springs Mountain and the heat exchange units at the north end of Bathhouse Row are the most visible components of the thermal water distribution system and represent its source portion. Not all of the boxes indicate a spring; some hold only valves and collection plumbing. The boxes higher up on the mountain allow access to the underground reservoirs and plumbing.

The valve and spring collection boxes are connected with the plumbing system delivering thermal water to reservoir R-1 under the east end and parking lot of the administration building at the south end of Bathhouse Row. This reservoir holds about 268,000 gallons and includes an overflow pipe connected to the Hot Springs Creek arch.

In the administration building basement, two pumps (P-1 and P-2) move the thermal water through a twelve-inch cast-iron pipe in the Hot Springs Creek arch to the bathhouses, the heat exchangers, and a 100,000-gallon underground storage reservoir (R-3) about 120 feet above Bathhouse Row. The elevation of this reservoir ensures an ample supply of water at about 52 pounds per square inch (psi) when pumps P-1 and P-2 are idle. When demand increases, pumps P-6 and P-7 transfer thermal water from reservoir R-3 to another 100,000-gallon reservoir (R4) about 220 feet above Bathhouse Row. The plumbing for a number of bathhouses no longer in operation is still in the distribution system as well.

Surprisingly enough the water within the distribution system stays well above 100°F (37.8°C); the water has been flowing into it for decades, and the terrain around the reservoirs and plumbing is heat saturated. As a result, the water arriving at the bathhouses is far too hot for direct bathing. By the 1890s most of the bathhouses had individual cooling towers to cool down the thermal water. These and similar towers were used until the central thermal water cooling system was completed on February 8, 1950. The system is comprised of two heat exchangers (#1 and #2), two pumps (P-3 and P-4), and a 400,000-gallon reservoir (R-2). The first exchanger is a thermal water-to-air cooling unit that works like a car radiator; it contains a primary and secondary section,

each with a large fan to force air through its radiator cores. When both sections of heat exchanger #1 are unable to cool the water sufficiently, #2 comes on line. This exchanger runs cold city water over the tubes carrying the thermal water but never mixes with it. The city water, which is heated in the process, is discharged into the Hot Springs Creek arch, and pumps P-3 and P-4 move the cooled thermal water (still 100% spring water) into reservoir R-2. This reservoir is next to and at the same elevation as reservoir R-3, so an ample supply of cooled water is also available at about 52 psi. The system for delivering cooled thermal water is similar to the hot spring water distribution system.

By mixing hot and cooled spring water, attendants can administer baths at the temperature (98° to 100°F, 36.7° to 37.8°C) required by regulations. The system was designed to produce thermal water cooled to temperatures ranging from 75° to 90°F (24° to 32.2°C). During most of the year when outdoor temperatures are below 80°F (26.7°C), the system works well, but during the hot summer months the desired temperature range is difficult to achieve. To compensate, heat exchanger #2 has been redesigned, and installation of new equipment began in the first quarter of fiscal year 2001.

The entire system is monitored automatically from the basement of the park administration building. The quantity and temperature of the water coming in from the springs are recorded continuously for 24 hours a day, as are water levels in each reservoir. Meters at each bathhouse transmit readings on the amount of water used to the monitoring center. Analyses of these data alert maintenance workers to the possibility of major leaks or equipment failure.

One source of equipment failure is the buildup of calcium carbonate, or limestone, in the system. Similar to the water found in caves, the spring water contains dissolved limestone that can be deposited in pipes, valves, and other system components, particularly in those handling cooled spring water. Because calcium carbonate is less soluble in cold water, it settles out in greater quantities in cooled water systems. Also called "tufa," the deposit is left wherever the thermal springs flow. In fact, the porous gray tufa formations behind Bathhouse Row are really geological "maps" showing where the springs once flowed freely down the mountainside.

From: Said, Maria
Sent: 8 Aug 2019 16:28:19 -0400
To: Haselow, Dirk (CDC arkansas.gov);Terry Paul;Richard McMullen, Ph.D.;Cat Waters;Cooley, Laura A. (CDC/DDID/NCIRD/DBD);Smith, Jessica (CDC/DDID/NCIRD/DBD);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Laura Miller;Justin Cully;Alexandra Picavet;Brent Everitt;Kesteloot, Kurt
Subject: Legionella results back - can we meet 4:45pm ET/3:45 CT?

Hi all,

Kurt has the results back. Can we discuss by phone?

We can use our conference line 1-866-723-8146 PC 7713400.

I may have missed some folks at CDC, Arkansas HD, HOSP - please feel free to forward to others you think should be present. But would like to discuss internally as a group before notifying the Quapaw - thanks.

Thanks.
Maria

From: Said, Maria
Sent: 1 Oct 2019 13:59:58 -0400
To: Lucas, Claressa (CDC/DDID/NCIRD/DBD);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Smith, Jessica (CDC/DDID/NCIRD/DBD)
Cc: Kesteloot, Kurt;Laura Miller
Subject: Positive lab report from the Quapaw
Attachments: PASL Report #346755R.pdf

I'm attaching the official lab report from the shower in the Quapaw fyi.
Thanks.
Maria

Phigenics Validation Test PREMIUM Analytical Report

Method Used: Next Day *Legionella* PCR™, TimeZero™, and Standard ISO 11731 Spread Plate

Sample Information	
PASL #	346755R
Date of Collection/Inoculation	2019/09/18
Date of Plating	2019/09/19
Date of Analysis	2019/09/30

Molecular Marker Negative Screen	
<i>Legionella</i>	Detected

Total Heterotrophic Aerobic Bacteria	
***	10 ³ CFU/mL
Score	

Legionella Results			
<i>L. pneumophila</i> serogroup 1	0	CFU	ND
<i>L. pneumophila</i> serogroups 2-14	3	CFU	30
<i>Legionella</i> species	0	CFU	ND

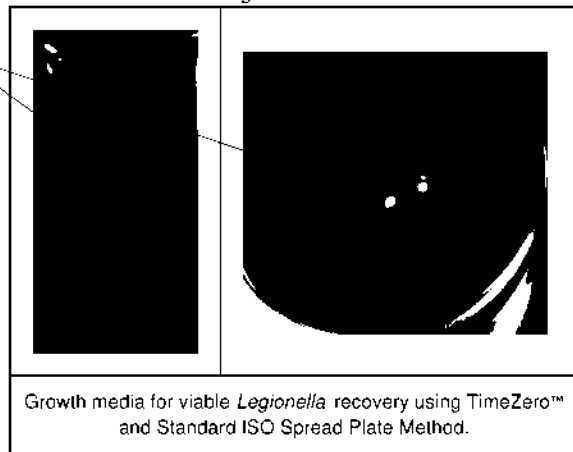
Total Heterotrophic Aerobic Bacteria



Growth media for viable total heterotrophic aerobic bacteria.

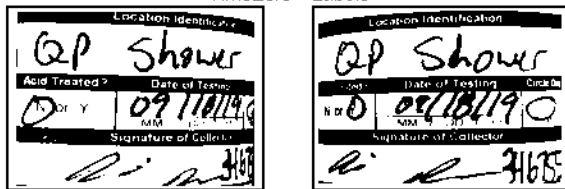
Confirmed *Legionella* Colonies

Legionella Count



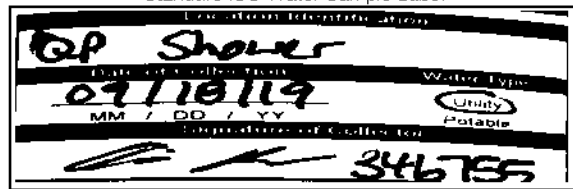
Growth media for viable *Legionella* recovery using TimeZero™ and Standard ISO Spread Plate Method.

TimeZero™ Labels



Notes: TimeZero™ received intact. ND indicates *Legionella* was not detected. Colonies tested positive for *Legionella* using the TimeZero™ Method (as shown above).

Standard ISO Water Sample Label



Notes: Colonies tested positive for *Legionella* using the Standard ISO 11731 Spread Plate Method (as shown above).

Analyst Signature Anna Karim
 Date 2019/09/30

Reviewer Signature William J. McCoy
 Date 2019/09/30

Disclaimer: Results from the PVT, or from any other analytical protocol for that matter, do not necessarily provide enough evidence to ensure that hazards from pathogenic microorganisms have been eliminated or controlled nor that risk of harm from such hazards has been reduced. Results from the PVT should only be interpreted within the context of properly designed and implemented water management programs. No guarantee regarding results is expressed or implied. THE PVT AND THE RESULTS IT PRODUCES ARE PROVIDED ON AN "AS IS" BASIS. YOU ASSUME TOTAL RESPONSIBILITY AND RISK FOR YOUR USE OF THE PVT AND PHIGENICS IS NEITHER RESPONSIBLE NOR LIABLE FOR ANY DAMAGES ARISING OUT OF YOUR USE OF THE PVT. This report shall not be reproduced except in full and with the written approval of the laboratory.

From: Kesteloot, Kurt
Sent: 17 Jul 2019 01:43:21 -0500
To: Miller, Laura;Mark Scott
Cc: Sara Newman;Said, Maria;Robert Kammel;Terry.Paul@arkansas.gov;Richard.McMullen@arkansas.gov;Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: Quapaw Operation Recommendations for the Next 10-14 Days and Environmental Testing Conducted

Good Evening Mark and Laura,

Sorry this is so late. I was trying to work on some reports from last week and lost track of time. After further investigation, the Quapaw has approximately 8 individual baths. Seven (rooms A-G?) of those baths are on the main floor in a separate room adjacent to the four large bathing pools. The eighth bath is in the basement.

The following are recommendations for operations at the Quapaw for the next 10-14 days (until we receive lab results). After we have more data there may be other recommended changes.

1. Cease use of the "new" MicroSilk® hydrotherapy. The process results in water droplets.
2. Ensure the entire bath, jets, plumbing and Microsilks system is disinfected between each use. One option would be to add 8 ounces of bleach (6.25% NaOH solution) to a tub that is full above the jets and Microsilks port. The 8 ounces of bleach (NSF approved recommended) can be added to the water from the previous user. This should result in a superchlorinate solution of about 40 ppm of chlorine if there are about 100 gallons of water in the tub. At this concentration it is recommended that the superchlorinated water be circulated through the bath, jets, Microsilks system, and plumbing for approximately 5 minutes. Attendants should not be near the pool during this time and it would be best to leave the room and shut the door. After the time has passed the attendant could carefully enter the room turn off any pumps or circulation devices in the tub and leave the room for another few minutes. After that, the attendant could return and drain the tub and then fill for the next use. That said, it is not recommended that the tubs be filled more than ~30 minutes before each use or a time where the customer is not in water that is more than 2 hours old when they leave the tub. If the facility has a process that they believe is effective or has questions about this, please do not hesitate to call.
3. Work with Arkansas Department of Health (ADH) and the NPS Office of Public Health (OPH) on adjusting the pH in the four main bathing pools to help reduce chlorine usage and help ensure free chlorine residuals stay above 1.0 mg/L during high bather loading times. It is recommended that the chlorine residuals continue to be taken three times a day. However, they should be taken from the pools above versus the filter below. A couple of testing devices were recommended in the March report emailed in April of this year. The ADH had a BioGuard 1200-V multi-test kit that is fairly accurate and easy

to operated. It is recommended that the facility purchase a similarly accurate device that tests a minimum of free chlorine, total chlorine, and pH as soon as possible. Please contact the ADH and OPH if there are questions and provide daily emails of pH and chlorine residuals.

4. Follow the link below and commence work on a Water Management Plan. The ADH and OPH would be happy to answer any questions. Please email both of us with any and all questions. Also, if any major risks come up while completing this Water Management Plan, please notify OPH at once.

Water Management Plan Link: <https://www.cdc.gov/legionella/wmp/toolkit/index.html>

If I missed something, we can discuss tomorrow.

The following samples were collected over the last two days.

Samples Collected:

Quapaw:

Main Level:

Single Bath Use Area (Room F and G) likely Person 1 and Person 2 rooms for latest scenario.

Room F: Bulk mixed sample of tempered and thermal water (~104.8F) and swab in the jets.

Room G: Bulk thermal sample (~137F), bulk tempered sample (~94F), swab jets and micro bubbles emitter, and remove jet and swab.

Left Pool: Bulk and Swab

Center Pool: Bulk and Swab

Right Pool: Bulk and Swab

Upper Pool:

Shower Heads: Bulk and Swab

Basement:

Shower next to the only individual basement tub that has a skylight (~107F) bulk sample and swab.

Hatch area outside of the cave: excesses waste thermal water in large reservoir (~133F).

A bulk sample was taken and two swabs were taken.

Basement Water cascade wall fountain. Occasionally disinfected and was disinfected last week. It uses city water and had a temp of ~74F.

Basement Cave: I was not present but think it was just swabbed.

Please note: the temperatures and samples collected are from memory and the lab recorded the actual numbers. There were approximately 12 swabs may have been gathered along with about 9 bulk samples.

Fountains:

Display, Nobel, Cascade, and Two on bathhouse row. The state is going to talk to the City about testing a fountain immediately adjacent to the parking garage and possibly others.

Cooling Tower:

Bulk water from both towers. There are no condensation basins and no condensation was present. Since the water is only tempered down to ~90 degrees Fahrenheit moisture has not been visible.

Tempered (cold) thermal:

Bulk cold water at the Quapaw

Thermal Water:

Bulk hot water at the HQ collection box and the Quapaw

Quapaw:

Swabbed basement floor where there was standing water close to basement air intake and some building duct-work. Swabbed duct-work in the main bathing area and took bacteriological samples of the four pools. Chlorine and pH were also tested onsite for the four pools.

I think that covers most of the tests taken. I was not present for all and may have missed one or two.

Thank you to everyone who assisted and please share this message as needed. I hope to make the meeting tomorrow but will be in the field at BUFF with limited cell phone service at times. There is much more to talk about, such as plans for different scenarios, etc. However, I think we should all talk about that on the phone first.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

From: Kesteloot, Kurt
Sent: 7 Jan 2019 11:54:59 -0600
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] Accepted: Invitation: HOSP Environmental Testing Discussion @ Mon Jan 7, 2019 11:30am - 12:30pm (CST) (tir4@cdc.gov)

Thank you Troy,

<http://quapawbaths.com/>

Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

Attention Federal Employees Only: Please let us know how we are doing by completing a survey found at: <https://www.surveymonkey.com/s/NPS-OPH-CustServ>

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On Mon, Jan 7, 2019 at 11:28 AM Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov> wrote:

From: Kesteloot, Kurt
Sent: 10 Jul 2019 21:56:49 -0500
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Cc: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis
CDC49130

Hi Troy,

Thanks, I will try to call you tomorrow morning to share thoughts and we hope to have a call with Laura and others later.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
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Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

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On Wed, Jul 10, 2019 at 8:32 PM Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
<tir4@cdc.gov> wrote:

Hi Kurt,

I'm happy to speak with you in the morning. Feel free to give me a call at your convenience. I have another call from 10-1030 am but otherwise available. My cell is

(b)(6)

It looks like you've also reached out to Laura Cooley, which is good. I need to make sure that I'm coordinating with other members of the CDC team before giving any formal advice. However, I'm happy to talk with you informally and then loop in others as needed.

Troy

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From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, July 10, 2019 7:27 PM
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: Fwd: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130

Good Evening Troy,

Are you available for a call? Early tomorrow morning is best for me.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✘

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

----- Forwarded message -----

From: **Said, Maria** <maria_said@nps.gov>
Date: Wed, Jul 10, 2019 at 6:03 PM
Subject: Fwd: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130
To: Cooley, Laura A. (CDC/OID/NCIRD) <whz3@cdc.gov>
Cc: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Hi Laura,

Are you available to discuss this? I'm around tonight and early tomorrow morning - I'll be in clinic from 8:30am-12:30pm tomorrow but free after that.

Thank you!
Maria

----- Forwarded message -----

From: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Date: Wed, Jul 10, 2019 at 5:26 PM
Subject: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130
To: Brandi.Stricklin@arkansas.gov
<Brandi.Stricklin@arkansas.gov>, CATHERINE.WATERS@ARKANSAS.GOV
<CATHERINE.WATERS@arkansas.gov>, Debbie.Pledger@arkansas.gov
<Debbie.Pledger@arkansas.gov>, Haselow, Dirk (CDCarkansas.gov)
<dirk.haselow@arkansas.gov>, Wheeler, Gary (CDCarkansas.gov)
<gary.wheeler@arkansas.gov>, Safi, Haytham (CDCarkansas.gov)
<haytham.safi@arkansas.gov>, Michael.Cima@arkansas.gov
<Michael.Cima@arkansas.gov>
Cc: NCID DBMD Travel-Legionella (CDC)
<travellegionella@cdc.gov>, maria_said@nps.gov <maria_said@nps.gov>

Dear Colleague(s):

Please see the attached notification regarding a case of Legionnaires' disease that may be travel-associated. This patient had exposure to the Quapaw Baths & Spa. We are aware of 2 additional cases with exposure to this location within the past year
(b)(6) I have requested MS to obtain the lower respiratory specimen, if available. Please see below for hot tub guidance:

Hot tub guidance:

- CDC webpage for water system maintenance and operating public hot tubs: <http://www.cdc.gov/legionella/water-system-maintenance.html>
- CDC fact sheet for disinfecting hot tubs containing *Legionella*:
<http://www.cdc.gov/legionella/downloads/hot-tub-disinfection.pdf>
- Hot tub maintenance fact sheet: <http://www.cdc.gov/healthywater/pdf/swimming/resources/operating-public-hot-tubs-factsheet.pdf>

Thanks,
Sooji

—

Sooji Lee, MS, MSPH

Entomologist (IHRC, Inc.)

Legionella Team (NCIRD/DBD/RDB)

Centers for Disease Control and Prevention

1600 Clifton Road, MS 1124-6 | Atlanta, GA 30329

Phone: 404-718-3192 | Email: slee7@cdc.gov

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 11 Jul 2019 01:31:28 +0000
To: Kesteloot, Kurt
Cc: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis
CDC49130

Hi Kurt,

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It looks like you've also reached out to Laura Cooley, which is good. I need to make sure that I'm coordinating with other members of the CDC team before giving any formal advice. However, I'm happy to talk with you informally and then loop in others as needed.

Troy

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From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, July 10, 2019 7:27 PM
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: Fwd: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130

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Are you available for a call? Early tomorrow morning is best for me.

Thank You and Very Respectfully,

Kurt

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Email: Kurt_Kesteloot@nps.gov

✕

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

----- Forwarded message -----

From: **Said, Maria** <maria_said@nps.gov>

Date: Wed, Jul 10, 2019 at 6:03 PM

Subject: Fwd: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis
CDC49130

To: Cooley, Laura A. (CDC/OID/NCIRD) <whz3@cdc.gov>

Cc: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Hi Laura,

Arc you available to discuss this? I'm around tonight and early tomorrow morning - I'll be in clinic from 8:30am-12:30pm tomorrow but free after that.

Thank you!

Maria

----- Forwarded message -----

From: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>

Date: Wed, Jul 10, 2019 at 5:26 PM

Subject: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130

To: Brandi.Stricklin@arkansas.gov

<Brandi.Stricklin@arkansas.gov>, CATHERINE.WATERS@ARKANSAS.GOV

<CATHERINE.WATERS@arkansas.gov>, Debbie.Pledger@arkansas.gov

<Debbie.Pledger@arkansas.gov>, Haselow, Dirk (CDCarkansas.gov)

<dirk.haselow@arkansas.gov>, Wheeler, Gary (CDCarkansas.gov)

<gary.wheeler@arkansas.gov>, Safi, Haytham (CDCarkansas.gov)

<haytham.safi@arkansas.gov>, Michael.Cima@arkansas.gov

<Michael.Cima@arkansas.gov>

Cc: NCID DBMD Travel-Legionella (CDC)

<travellegionella@cdc.gov>, maria_said@nps.gov <maria_said@nps.gov>

Dear Colleague(s):

Please see the attached notification regarding a case of Legionnaires' disease that may be travel-associated. This patient had exposure to the Quapaw Baths & Spa. We are aware of 2 additional cases with exposure to this location within the past year ((b)(6))

(b)(6)

I have requested MS to obtain the lower respiratory specimen, if available.

Please see below for hot tub guidance:

Hot tub guidance:

- CDC webpage for water system maintenance and operating public hot tubs:<http://www.cdc.gov/legionella/water-system-maintenance.html>
- CDC fact sheet for disinfecting hot tubs containing *Legionella*:
<http://www.cdc.gov/legionella/downloads/hot-tub-disinfection.pdf>
- Hot tub maintenance fact sheet:<http://www.cdc.gov/healthywater/pdf/swimming/resources/operating-public-hot-tubs-factsheet.pdf>

Thanks,

Sooji

—

Sooji Lee, MS, MSPH

Epidemiologist (IIIRC, Inc.)

Legionella Team (NCIRD/DBD/ROB)

Centers for Disease Control and Prevention

1600 Clifton Road, MS 1174-b | Atlanta, GA 30329

Phone: 404-718-3192 | slee7@cdc.gov

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Maria Said, MD, MIIS CDR, U.S. Public Health Service

Epidemiology Branch Chief Office of Public Health National Park Service

Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 Washington, DC 20240

Office Tel: 202-513-7151 | Email: maria_said@nps.gov

Website (public): <https://www.nps.gov/orgs/1878/index.htm>

Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 11 Jul 2019 04:03:55 +0000
To: Kesteloot, Kurt
Cc: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130

That sounds good, Kurt. I look forward to talking with you.

Troy

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From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, July 10, 2019 9:56:49 PM
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Cc: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130

Hi Troy,

Thanks, I will try to call you tomorrow morning to share thoughts and we hope to have a call with Laura and others later.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

On Wed, Jul 10, 2019 at 8:32 PM Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
<tir4@cdc.gov> wrote:

Hi Kurt,

I'm happy to speak with you in the morning. Feel free to give me a call at your convenience. I have another call from 10-1030 am but otherwise available. My cell is

(b)(6)

It looks like you've also reached out to Laura Cooley, which is good. I need to make sure that I'm coordinating with other members of the CDC team before giving any formal advice. However, I'm happy to talk with you informally and then loop in others as needed.

Troy

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From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, July 10, 2019 7:27 PM
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: Fwd: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130

Good Evening Troy,

Are you available for a call? Early tomorrow morning is best for me.

Thank You and Very Respectfully,

Kurt

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Email: Kurt_Kesteloot@nps.gov

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"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

----- Forwarded message -----

From: **Said, Maria** <maria_said@nps.gov>

Date: Wed, Jul 10, 2019 at 6:03 PM

Subject: Fwd: [EXTERNAL] CONFIDENTIAL: travel-associated legionellosis CDC49130

To: Cooley, Laura A. (CDC/OID/NCIRD) <whz3@cdc.gov>

Cc: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

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Maria

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<CATHERINE.WATERS@arkansas.gov>, Dcbbic.Pledger@arkansas.gov

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Cc: NCID DBMD Travel-Legionella (CDC)

<travellegionella@cdc.gov>, maria_said@nps.gov <maria_said@nps.gov>

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- Hot tub maintenance fact sheet: <http://www.cdc.gov/healthywater/pdf/swimming/resources/operating-public-hot-tubs-factsheet.pdf>

Thanks,
Sooji

—

Sooji Lee, MS, MSPH

Epidemiologist (IHRC, Inc.)

Legionella Team (NCIRD/DBD/RDB)

Centers for Disease Control and Prevention

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Phone: 404-718-3192 | Email: slee7@cdc.gov

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
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Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
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Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 26 Nov 2019 13:41:22 +0000
To: Kesteloot, Kurt
Subject: Re: [EXTERNAL] Declined: Invitation: HOSP Legionella Update/Discussion @ Tue Nov 26, 2019 2pm - 3pm (CST) (tir4@cdc.gov)

9:15 sounds good. Please call my cell at (b)(6)

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From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Tuesday, November 26, 2019 8:10:25 AM
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>
Subject: Re: [EXTERNAL] Declined: Invitation: HOSP Legionella Update/Discussion @ Tue Nov 26, 2019 2pm - 3pm (CST) (tir4@cdc.gov)

Good Morning Troy,

Thanks for letting me know. Can you talk in about an hour? Maybe 9:15 your time? I would like to share my thoughts with you and see if you have anything to add.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3, 4, and 5, Great Lakes, Mississippi Basin, and Missouri Basin
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

On Tue, Nov 26, 2019 at 6:31 AM Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov> wrote:

Hi Kurt, I'm not available during the scheduled time but able to talk this morning if you want to give me a call.

From: Ritter, Troy (CDC/ONDIEH/NCEH)
Sent: 24 Aug 2018 13:49:13 +0000
To: Kramer, Adam (CDC/ONDIEH/NCEH)
Subject: RE: [EXTERNAL] Fwd: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

I got the go-ahead from Sarisky for the informal consult. I'll be in meetings until around 2p today but happy to chat after.

From: Kramer, Adam (CDC/ONDIEH/NCEH)
Sent: Friday, August 24, 2018 9:40 AM
To: Ritter, Troy (CDC/ONDIEH/NCEH) <tir4@cdc.gov>; Kunz, Jasen M. (CDC/ONDIEH/NCEH) <izk0@cdc.gov>
Subject: RE: [EXTERNAL] Fwd: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

Thanks Troy.

I think at this point, (b)(5)
(b)(5)
(b)(5) Nothing formal at this point, just wanted to discuss their approach.

Adam

From: "Ritter, Troy (CDC/ONDIEH/NCEH)" <tir4@cdc.gov>
Sent: Friday, August 24, 2018 8:32 AM
To: "Kramer, Adam (CDC/ONDIEH/NCEH)" <ank5@cdc.gov>,"Kunz, Jasen M. (CDC/ONDIEH/NCEH)" <izk0@cdc.gov>
Subject: RE: [EXTERNAL] Fwd: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

Hi Adam,

Jasen is on leave and I'm running point for Legionella response. The issue described below seems to be fairly straightforward but I'd like to run this by Sarisky and possibly our Legionella program partners here at CDC. I'll get back to you ASAP.

Troy

From: Kramer, Adam (CDC/ONDIEH/NCEH)
Sent: Friday, August 24, 2018 9:15 AM
To: Kunz, Jasen M. (CDC/ONDIEH/NCEH) <izk0@cdc.gov>; Ritter, Troy (CDC/ONDIEH/NCEH)

<tir4@cdc.gov>

Subject: Fwd: [EXTERNAL] Fwd: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

Hi Jasen and Troy,

Would one of you be able to give Kurt a call? He'd like to discuss with you their plan and the rationale for the water system. Kurt, is the team lead over water/wastewater issues (if they still have it broken up that way) and used to cover Hot Springs so he is familiar with the water distribution system.

He was also a former IHS engineer before coming to NPS.

Thank you,

Adam

From: "Kesteloot, Kurt" <kurt_kesteloot@nps.gov>

Sent: Thursday, August 23, 2018 4:00 PM

To: "Kramer, Adam (CDC/ONDIEH/NCEH)" <ank5@cdc.gov>

Subject: Re: [EXTERNAL] Fwd: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

Hi Adam,

Great to hear from you. Thanks for thinking of me. We just found out from the park yesterday.

Here is where we are at...

Good Afternoon,

We had a great discussion at noon today with Dr. Said, HOSP Management, and etc. Thank you to LCDR Kostamo for on the ground work and CDR Maria Said for further research.

We cannot confirm that Legionella was transmitted at HOSP Quawpaw. We cannot confirm if or where it happened at HOSP. There are many potential locations where a legionella environment could occur in the Park and nearby. With research from Dr. Said, it is advised that we do not do environmental testing until we have a cluster of cases. If we find out about another case, we will be able to ask more questions to determine if they are linked and where it may have happened.

Meanwhile, the NPS OPH will continue to work with HOSP on minimizing risk for Legionella and other recreational water concerns. I recommended testing for the Quapaw in May of this year and they were given 60 days to comply. We are now at 90 days and the Park is assisting them to help conduct recommended pool/spa water quality testing.

OPH will also be talking to the Park more about disinfecting the thermal water at HOSP. Currently the water temperature ranges from 143 degrees Fahrenheit to 146 degrees Fahrenheit (F). The food code requires food to be held at 135F. Thus, the park has been operating under the requirement that all thermal water that is potable must leave the spigots at 135F. There are several other areas where visitors can be exposed to aerosolized water that is non potable. We are talking about providing disinfection for those waters to help reduce risk of Legionella. It is also important to note this is the only confirmed case of Legionnaire that we have heard about for HOSP since 2010.

I will update as we find out more information and welcome any questions, comments, or concerns.

Thank You and Very Respectfully,

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
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Email: Kurt_Kesteloot@nps.gov

x]

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"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share."

On Thu, Aug 23, 2018 at 3:14 PM, Kramer, Adam (CDC/ONDIEH/NCEH) <ank5@cdc.gov> wrote:

FYI

From: "EPIX Update (CDC)" <epixupdate@cdc.gov>

Sent: Thursday, August 23, 2018 2:52 PM

To:

Subject: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

Epi-X *The Epidemic
Information Exchange*

Check Epi-X for an Important Report

Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

The National Park Service (NPS) Office of Public Health is aware of a case of Legionnaires' disease associated with a visit to Hot Springs National Park in July 2018.

<https://epix2.cdc.gov/v2/Reports/Display.aspx?id=66780>

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From: Kramer, Adam (CDC/ONDIEH/NCEH)
Sent: 24 Aug 2018 09:40:14 -0400
To: Ritter, Troy (CDC/ONDIEH/NCEH);Kunz, Jasen M. (CDC/ONDIEH/NCEH)
Subject: RE: [EXTERNAL] Fwd: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

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Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

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"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share."

On Thu, Aug 23, 2018 at 3:14 PM, Kramer, Adam (CDC/ONDIEH/NCEH) <ank5@cdc.gov> wrote:

FYI

From: "EPIX Update (CDC)" <epixupdate@cdc.gov>

Sent: Thursday, August 23, 2018 2:52 PM

To:

Subject: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018



Check Epi-X for an Important Report

Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

The National Park Service (NPS) Office of Public Health is aware of a case of Legionnaires' disease associated with a visit to Hot Springs National Park in July 2018.

<https://epix2.cdc.gov/v2/Reports/Display.aspx?id=66780>

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From: Kunz, Jasen M. (CDC/ONDIEH/NCEH)
Sent: 24 Aug 2018 14:04:43 -0400
To: Kramer, Adam (CDC/ONDIEH/NCEH); Ritter, Troy (CDC/ONDIEH/NCEH)
Subject: RE: [EXTERNAL] Fwd: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

Troy be sure to link in ncird on any discussions. Thanks.

Sent from iPhone

From: Kramer, Adam (CDC/ONDIEH/NCEH) <ank5@cdc.gov>
Date: August 24, 2018 at 9:40:15 AM EDT
To: Ritter, Troy (CDC/ONDIEH/NCEH) <tir4@cdc.gov>, Kunz, Jasen M. (CDC/ONDIEH/NCEH) <izk0@cdc.gov>
Subject: RE: [EXTERNAL] Fwd: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

Thanks Troy.

I think at this point, (b)(3)
(b)(3)
(b)(3) Nothing formal at this point, just wanted to discuss their approach.

Adam

From: "Ritter, Troy (CDC/ONDIEH/NCEH)" <tir4@cdc.gov>
Sent: Friday, August 24, 2018 8:32 AM
To: "Kramer, Adam (CDC/ONDIEH/NCEH)" <ank5@cdc.gov>,"Kunz, Jasen M. (CDC/ONDIEH/NCEH)" <izk0@cdc.gov>
Subject: RE: [EXTERNAL] Fwd: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

Hi Adam,

Jasen is on leave and I'm running point for Legionella response. The issue described below seems to be fairly straightforward but I'd like to run this by Sarisky and possibly our Legionella program partners here at CDC. I'll get back to you ASAP.

Troy

From: Kramer, Adam (CDC/ONDIEH/NCEH)
Sent: Friday, August 24, 2018 9:15 AM
To: Kunz, Jasen M. (CDC/ONDIEH/NCEH) <izk0@cdc.gov>; Ritter, Troy (CDC/ONDIEH/NCEH) <tir4@cdc.gov>
Subject: Fwd: [EXTERNAL] Fwd: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

Hi Jasen and Troy,

Would one of you be able to give Kurt a call? He'd like to discuss with you their plan and the rationale for the water system. Kurt, is the team lead over water/wastewater issues (if they still have it broken up that way) and used to cover Hot Springs so he is familiar with the water distribution system.

He was also a former IHS engineer before coming to NPS.

Thank you,

Adam

From: "Kesteloot, Kurt" <kurt_kesteloot@nps.gov>
Sent: Thursday, August 23, 2018 4:00 PM
To: "Kramer, Adam (CDC/ONDIEH/NCEH)" <ank5@cdc.gov>
Subject: Re: [EXTERNAL] Fwd: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

Hi Adam,

Great to hear from you. Thanks for thinking of me. We just found out from the park yesterday.

Here is where we are at...

Good Afternoon,

We had a great discussion at noon today with Dr. Said, HOSP Management, and etc. Thank you to LCDR Kostamo for on the ground work and CDR Maria Said for further research.

We cannot confirm that Legionella was transmitted at HOSP Quawpaw. We cannot confirm if or where it happened at HOSP. There are many potential locations where a legionella environment could occur in the Park and nearby. With research from Dr. Said, it is advised that we do not do environmental testing until we have a cluster of cases. If we find out about another case, we will be able to ask more questions to determine if they are linked and where it may have happened.

Meanwhile, the NPS OPH will continue to work with HOSP on minimizing risk for Legionella and other recreational water concerns. I recommended testing for the Quapaw in May of this year and they were given 60 days to comply. We are now at 90 days and the Park is assisting them to help conduct recommended pool/spa water quality testing.

OPH will also be talking to the Park more about disinfecting the thermal water at HOSP. Currently the water temperature ranges from 143 degrees Fahrenheit to 146 degrees Fahrenheit (F). The food code requires food to be held at 135F. Thus, the park has been operating under the requirement that all thermal water that is potable must leave the spigots at 135F. There are several other areas where visitors can be exposed to aerosolized water that is non potable. We are talking about providing disinfection for those waters to help reduce risk of Legionella. It is also important to note this is the only confirmed case of Legionnaire that we have heard about for HOSP since 2010.

I will update as we find out more information and welcome any questions, comments, or concerns.

Thank You and Very Respectfully,

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
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"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share."

On Thu, Aug 23, 2018 at 3:14 PM, Kramer, Adam (CDC/ONDIEH/NCEH) <ank5@cdc.gov> wrote:

FYI

From: "EPIX Update (CDC)" <epixupdate@cdc.gov>

Sent: Thursday, August 23, 2018 2:52 PM

To:

Subject: Important: Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018



Check Epi-X for an Important Report

Call for Cases: Legionnaires' Disease Associated with Hot Springs National Park — Arkansas, 2018

The National Park Service (NPS) Office of Public Health is aware of a case of Legionnaires' disease associated with a visit to Hot Springs National Park in July 2018.

<https://epix2.cdc.gov/v2/Reports/Display.aspx?id=66780>

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From: Kurt Kesteloot
Sent: 5 Aug 2019 04:33:52 -0700
To: Anthony
Cc: Terry Paul;Haselow, Dirk (CDC arkansas.gov);Bob Kempkes;Maria Said;Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] Quapaw

Good Morning Anthony,

Yes, we can have a call about cleaning. We will try to get a few people together for a call. Does 11 or 1130 central time work?

We can also talk about hypotheticals for additional testing and will need to have a call Friday to discuss actual a after we have all of the results.

Very Respectfully,

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, MWR
National Park Service, Office of Public Health
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 402-661-1718
Cell Phone: 202-641-0055

Sent from my iPhone

> On Aug 4, 2019, at 8:08 PM, Anthony <anthony@taylorkempkes.com> wrote:

>

>

> All,

> Could we schedule a call for tomorrow morning to discuss our cleaning procedures and follow up testing?

> Thanks

> Anthony

> Sent from my iPhone

From: anthony@taylorkempkes.com
Sent: 5 Aug 2019 08:31:59 -0500
To: 'Kurt Kesteloot'
Cc: 'Terry Paul'; Haselow, Dirk (CDC arkansas.gov); 'Bob Kempkes'; 'Maria Said'; Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: RE: [EXTERNAL] Quapaw

Kurt,
11 am CDT works best for me, as I have to leave at noon for a meeting in West Arkansas.
Thanks for the prompt response.

Anthony Taylor
Taylor/Kempkes Architects, P.A.
210 Central Ave. Suite 3A
Hot Springs National Park, AR 71901
Phone: (501) 624-5679
Fax: (501) 623-3166

-----Original Message-----

From: Kurt Kesteloot <kurt_kesteloot@nps.gov>
Sent: Monday, August 5, 2019 6:34 AM
To: Anthony <anthony@taylorkempkes.com>
Cc: Terry Paul <terry.paul@arkansas.gov>; Dirk Haselow <dirk.haselow@arkansas.gov>; Bob Kempkes <bob@taylorkempkes.com>; Maria Said <maria_said@nps.gov>; tir4@cdc.gov
Subject: Re: [EXTERNAL] Quapaw

Good Morning Anthony,

Yes, we can have a call about cleaning. We will try to get a few people together for a call. Does 11 or 1130 central time work?

We can also talk about hypotheticals for additional testing and will need to have a call Friday to discuss actual a after we have all of the results.

Very Respectfully,

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, MWR National Park Service, Office of Public Health
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 402-661-1718
Cell Phone: 202-641-0055

Sent from my iPhone

> On Aug 4, 2019, at 8:08 PM, Anthony <anthony@taylorkempkes.com> wrote:
>
>
> All,
> Could we schedule a call for tomorrow morning to discuss our cleaning procedures and follow up testing?
> Thanks
> Anthony

> Sent from my iPhone

From: Kesteloot, Kurt
Sent: 4 Oct 2019 13:50:15 -0500
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Cc: maria_said@nps.gov; Lucas, Claressa (CDC/DDID/NCIRD/DBD); Smith, Jessica (CDC/DDID/NCIRD/DBD); Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR); Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] RE: 10-4-19 Legionella Sampling Plan

Hi Jasen,

This does help and I appreciate the feedback. Depending on the results, we may have to look at better plans in the future for each building.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

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On Fri, Oct 4, 2019 at 12:42 PM Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov> wrote:

Kurt,

I am writing back to you on behalf the team.

(b)(5)

(b)(5)

Hope this helps some and we are always available to chat.

Jasen

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Friday, October 4, 2019 7:48 AM
To: Mark Scott <Mark_Scott@nps.gov>; laura_a_miller@nps.gov
Cc: Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Maria Said <maria_said@nps.gov>; Robert Kammel <bob_kammel@nps.gov>
Subject: 10-4-19 Legionella Sampling Plan

Good Morning Everyone,

Mark and I talked yesterday about the attached sampling plan for today. I have attached a drawing that lists the samples and shows a rough overview of the system. If anyone has any additional thoughts, comments, or questions, please let me know.

Currently, I have 23 locations listed. Thus, we have two more available if needed. I have not listed the thermal water system main tank under administration because it has been tested at least three times (once with PCR/new lab) and has been negative all times. I have also excluded the showers in the Quapaw because they were plumbed improperly and will not be used that way ever again. All of the tests focus on the NPS water system, we could talk to the city about testing their fountains and/or test the city water in the Quapaw (showers on main level and one in the basement). Any thoughts?

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPII),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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On Thu, Oct 3, 2019 at 3:50 PM Maria Said <maria_said@nps.gov> wrote:

Thanks Claressa. And to take it one step further, positive PCR results will be much less useful, right? My understanding is that they are not accurate for predicting culture results and we would just have to wait for cultures to be finalized, correct?

Thank you again!

Maria Said, MD, MHS
CDR, US Public Health Service

Epidemiology Branch Chief
Office of Public Health
National Park Service
(O) 202-513-7151
(C) 202-538-5682

> On Oct 3, 2019, at 3:52 PM, Lucas, Claressa (CDC/DDID/NCIRD/DBD)
<chl9@cdc.gov> wrote:

>
> Hi Maria,
> Yes, negative PCR results are >99% predictive of a negative culture result.

>
> Best wishes,
> Claressa

>
> -----Original Message-----
> From: Maria Said <maria_said@nps.gov>
> Sent: Thursday, October 3, 2019 3:49 PM
> To: James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>;
> jennifer.dillaha@arkansas.gov; Kurt Kesteloot <kurt_kesteloot@nps.gov>;
> laura_a_miller@nps.gov; Lucas, Claressa (CDC/DDID/NCIRD/DBD)
> <chl9@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>;
> Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>
> Subject: Re: PCR?

>
> It looks from the lab that PCR results would be available the next day after
testing.

>
> Claressa, am I correct that negative PCR results are highly predictive that culture
results will be negative as well?

>
> It seems to me that if we are able to get this information quickly, that will be very
helpful to us in determining our modes of notification.

>
> Thank you! Maria

>
> Maria Said, MD, MHS
> CDR, US Public Health Service
> Epidemiology Branch Chief
> Office of Public Health
> National Park Service
> (O) 202-513-7151
> (C) 202-538-5682

>
>

>> On Oct 3, 2019, at 3:40 PM, Maria Said <maria_said@nps.gov> wrote:

>>

>> Does anyone know how quickly PCR results could be turned around? My
>> understanding of PCR is that negative PCR has a high predictive value and
>> could be very useful in this situation if we can get results quickly. Thanks. Maria

>>

From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 15 Jul 2019 13:08:58 +0000
To: Kesteloot, Kurt
Cc: Terry Paul;Richard McMullen, Ph.D.
Subject: Re: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

Kurt,

If you can take parameters that would be good. I understand it's short notice. Do what you can do! Also, I'm available today if you need anything. Feel free to call.

Troy

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From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Sunday, July 14, 2019 11:16:30 PM
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Cc: Terry Paul; Richard McMullen, Ph.D.
Subject: Re: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

Hi Troy,

Very good question. I can measure temperature and we should be able to measure chlorine. Hopefully the lab will also be able to do pH. Yes, I think we should test all of those as well.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
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Omaha, NE 68102
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Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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On Fri, Jul 12, 2019 at 7:52 PM Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov> wrote:

Kurt,

I'm sorry if I missed this piece of information but are you planning to

(b)(3)

(b)(3)

Troy

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From: Terry Paul <Terry.Paul@arkansas.gov>

Sent: Friday, July 12, 2019 3:42:18 PM

To: 'Kesteloot, Kurt'

Cc: Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Richard McMullen, Ph.D.

Subject: RE: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

As far as I know right now that should be fine.

Terry

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Sent: Friday, July 12, 2019 2:28 PM

To: Terry Paul <Terry.Paul@arkansas.gov>

Cc: tir4@cdc.gov; Richard McMullen, Ph.D. <Richard.McMullen@arkansas.gov>

Subject: Re: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

Hi Terry,

It will be just me. I hope to arrive in Hot Springs around 1 p.m. Should we meet at the admin building?

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
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Email: Kurt_Kesteloot@nps.gov

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On Fri, Jul 12, 2019 at 1:58 PM Terry Paul <Terry.Paul@arkansas.gov> wrote:

What time are you fellows planning to be in hot springs?

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From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Friday, July 12, 2019 12:13:15 PM
To: Terry Paul
Cc: tir4@cdc.gov; Richard McMullen, Ph.D.
Subject: Re: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

Hi Terry,

Great! This is who Justin emailed.

jhenry@atokainc.com,
croberts@atokainc.com

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
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Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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On Fri, Jul 12, 2019 at 11:33 AM Terry Paul <Terry.Paul@arkansas.gov> wrote:

The laboratory does not matter to me. Just knowing who will be taking the samples with the supplies would be good for us to know as soon as possible.

We can be there at any time Monday and or Tuesday.

Thanks TP

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Friday, July 12, 2019 11:13 AM
To: Terry Paul <Terry.Paul@arkansas.gov>
Cc: tir4@cdc.gov; Richard McMullen, Ph.D. <Richard.McMullen@arkansas.gov>
Subject: Re: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

Hi Terry,

Will you be able to make it Monday too? Justin contacted a lab. I am not sure if it is the lab you are referencing. I think we will need about 30 bulk and 30 swab samples. I like the additional recommendations and agree.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
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Email: Kurt_Kesteloot@nps.gov

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On Fri, Jul 12, 2019 at 9:37 AM Terry Paul <Terry.Paul@arkansas.gov> wrote:

Gentlemen,

Let me know as soon as possible about any discussion on the actual taking of the samples. I would suggest starting with the Quapaw since that is the focus of concern. Then moving to the other sites. If we need to collect the samples we will need to get with our laboratory today to see if we have the necessary supplies.

We also suggest at least a look at the ventilation systems and duct work to determine if any moisture is present in those areas.

Thanks Terry!

501-661-2171

501-786-9144

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Friday, July 12, 2019 8:28 AM
To: tir4@cdc.gov; Terry Paul <Terry.Paul@arkansas.gov>
Subject: Re: DRAFT Sampling Plan for Tomorrow's Discussion

Good Morning,

Here is the latest draft.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
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National Park Service, Office of Public Health (OPII),
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Email: Kurt_Kesteloot@nps.gov

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On Thu, Jul 11, 2019 at 11:21 PM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:

Good Evening Troy and Terry,

I will try to call you both tomorrow morning sometime. Hopefully around 0700 CDT. I have attached a few documents for your review. These are just a draft and need more review as it is late and I wanted to have something to share with you for our discussion. I have attached old system plans with comments, a MS Word document, and photos.

Talk to you tomorrow.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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species and the parks that we share." GREEN DOT

From: Kesteloot, Kurt
Sent: 14 Jul 2019 22:16:30 -0500
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Cc: Terry Paul;Richard McMullen, Ph.D.
Subject: Re: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

Hi Troy,

Very good question. I can measure temperature and we should be able to measure chlorine. Hopefully the lab will also be able to do pH. Yes, I think we should test all of those as well.

Thank You and Very Respectfully,

Kurt

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On Fri, Jul 12, 2019 at 7:52 PM Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
<tir4@cdc.gov> wrote:

Kurt,

I'm sorry if I missed this piece of information but are you planning to measure other parameters, such as chlorine, pH and temperature?

Troy

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From: Terry Paul <Terry.Paul@arkansas.gov>
Sent: Friday, July 12, 2019 3:42:18 PM
To: 'Kesteloot, Kurt'
Cc: Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Richard McMullen, Ph.D.
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Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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(b)(3)

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Email: Kurt_Kesteloot@nps.gov

✕

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

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Cc: tir4@cdc.gov; Richard McMullen, Ph.D. <Richard.McMullen@arkansas.gov>
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From: Terry Paul
Sent: 12 Jul 2019 18:57:45 +0000
To: Kesteloot, Kurt
Cc: Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Richard McMullen, Ph.D.
Subject: Re: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

What time are you fellows planning to be in hot springs?

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Sent: Friday, July 12, 2019 12:13:15 PM
To: Terry Paul
Cc: tir4@cdc.gov; Richard McMullen, Ph.D.
Subject: Re: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

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jhenry@atokainc.com,
croberts@atokainc.com

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Sent: 12 Jul 2019 12:13:15 -0500
To: Terry Paul
Cc: Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Richard McMullen, Ph.D.
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From: Terry Paul
Sent: 12 Jul 2019 16:33:37 +0000
To: 'Kesteloot, Kurt'
Cc: Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Richard McMullen, Ph.D.
Subject: RE: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

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Sent: 12 Jul 2019 16:25:51 +0000
To: Kesteloot, Kurt;Terry Paul
Cc: Richard McMullen, Ph.D.
Subject: Re: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

I'm sorry to be out of pocket. I'm driving from Nashville to Atlanta. I'm able to talk by phone but won't be able to review documents for a couple hours.

Troy

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From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Friday, July 12, 2019 12:13:16 PM
To: Terry Paul
Cc: Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Richard McMullen, Ph.D.
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From: Kesteloot, Kurt
Sent: 15 Jul 2019 08:44:37 -0500
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

Hi Troy,

Thanks, sounds good. Will Do.

Thank You and Very Respectfully,

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On Mon, Jul 15, 2019 at 8:09 AM Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov> wrote:

Kurt,

If you can take parameters that would be good. I understand it's short notice. Do what you can do! Also, I'm available today if you need anything. Feel free to call.

Troy

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From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Sunday, July 14, 2019 11:16:30 PM
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)

Cc: Terry Paul; Richard McMullen, Ph.D.

Subject: Rc: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

Hi Troy,

Very good question. I can measure temperature and we should be able to measure chlorine. Hopefully the lab will also be able to do pH. Yes, I think we should test all of those as well.

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On Fri, Jul 12, 2019 at 7:52 PM Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
<tir4@cdc.gov> wrote:

Kurt,

I'm sorry if I missed this piece of information but are you planning to measure other parameters, such as chlorine, pH and temperature?

Troy

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From: Terry Paul <Terry.Paul@arkansas.gov>

Sent: Friday, July 12, 2019 3:42:18 PM

To: 'Kesteloot, Kurt'

Cc: Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Richard McMullen, Ph.D.

Subject: RE: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

As far as I know right now that should be fine.

Terry

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Friday, July 12, 2019 2:28 PM
To: Terry Paul <Terry.Paul@arkansas.gov>
Cc: tir4@cdc.gov; Richard McMullen, Ph.D. <Richard.McMullen@arkansas.gov>
Subject: Re: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

Hi Terry,

It will be just me. I hope to arrive in Hot Springs around 1 p.m. Should we meet at the admin building?

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPII),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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On Fri, Jul 12, 2019 at 1:58 PM Terry Paul <Terry.Paul@arkansas.gov> wrote:

What time are you fellows planning to be in hot springs?

Get [Outlook for Android](#)

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Sent: Friday, July 12, 2019 12:13:15 PM

To: Terry Paul

Cc: tir4@cdc.gov; Richard McMullen, Ph.D.

Subject: Re: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

Hi Terry,

Great! This is who Justin emailed.

jhenry@atokainc.com,
croberts@atokainc.com

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCCE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPII),
601 Riverfront Drive
Omaha, NE 68102
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Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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On Fri, Jul 12, 2019 at 11:33 AM Terry Paul <Terry.Paul@arkansas.gov> wrote:

The laboratory does not matter to me. Just knowing who will be taking the samples with the supplies would be good for us to know as soon as possible.

We can be there at any time Monday and or Tuesday.

Thanks TP

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Friday, July 12, 2019 11:13 AM
To: Terry Paul <Terry.Paul@arkansas.gov>
Cc: tir4@cdc.gov; Richard McMullen, Ph.D. <Richard.McMullen@arkansas.gov>
Subject: Re: [EXTERNAL] RE: DRAFT Sampling Plan for Tomorrow's Discussion

Hi Terry,

Will you be able to make it Monday too? Justin contacted a lab. I am not sure if it is the lab you are referencing. I think we will need about 30 bulk and 30 swab samples. I like the additional recommendations and agree.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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On Fri, Jul 12, 2019 at 9:37 AM Terry Paul <Terry.Paul@arkansas.gov> wrote:

Gentlemen,

Let me know as soon as possible about any discussion on the actual taking of the samples. I would suggest starting with the Quapaw since that is the focus of concern. Then moving to the other sites. If we need to collect the samples we will need to get with our laboratory today to see if we have the necessary supplies.

We also suggest at least a look at the ventilation systems and duct work to determine if any moisture is present in those areas.

Thanks Terry!

501-661-2171

501-786-9144

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Friday, July 12, 2019 8:28 AM
To: tir4@cdc.gov; Terry Paul <Terry.Paul@arkansas.gov>
Subject: Re: DRAFT Sampling Plan for Tomorrow's Discussion

Good Morning,

Here is the latest draft.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
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Office Phone: 1-402-661-1718
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Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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On Thu, Jul 11, 2019 at 11:21 PM Kesteloot, Kurt
<kurt_kesteloot@nps.gov> wrote:

Good Evening Troy and Terry,

I will try to call you both tomorrow morning sometime. Hopefully around 0700 CDT. I have attached a few documents for your review. These are just a draft and need more review as it is late and I wanted to have something to share with you for our discussion. I have attached old system plans with comments, a MS Word document, and photos.

Talk to you tomorrow.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
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Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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From: Said, Maria
Sent: 18 Oct 2019 09:56:00 -0400
To: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Cc: Kurt Kesteloot; Scott, Mark; Sara Newman; Miller, Laura; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR); Lucas, Claessa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] RE: Hot Springs - Culture results

Hi all,

Here is an agenda that Kurt and I thought could help guide discussion. Looking forward to talking soon.

1. Quick epi update (Maria)
2. Laboratory results. We are especially interested in the significance of the Legionella in hot water. (Claessa and others at CDC)
3. Implications of laboratory results on how we view the hot water and what additional testing, if any, is needed.
4. Risk communication
5. Immediate remediation steps (Quapaw, Hale, Arlington, and the water system as a whole)
6. Plumbing issues (Kurt)

Thanks.
Maria

On Thu, Oct 17, 2019 at 10:53 AM Said, Maria <maria_said@nps.gov> wrote:
Great - I'll send out a calendar invite so folks can block it off and leave the Webex/call-in information blank until we set that up.
Maria

On Thu, Oct 17, 2019 at 10:43 AM Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

10:00 am ET still works for the CDC team. I'll block it on our calendars. Thanks!

From: Kurt Kesteloot <kurt_kesteloot@nps.gov>
Sent: Thursday, October 17, 2019 10:34 AM
To: Scott, Mark <mark_scott@nps.gov>; Said, Maria <maria_said@nps.gov>
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Sara Newman <sara_newman@nps.gov>; Miller, Laura <laura_a_miller@nps.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Lucas, Claessa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy

(CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>

Subject: Re: [EXTERNAL] RE: Hot Springs - Culture results

Hi Maria,

The 1000 am Eastern time sounds great for me. If that works for everyone else, I am happy to set a Webex and meeting invite later this evening.

Very Respectfully,

CDR Kurt Kesteloot, PE, BCEE, USPHS

Supervisory Public Health Consultant, Interior Regions 3-5

National Park Service, Office of Public Health

601 Riverfront Drive

Omaha, NE 68102

Office Phone: 402-661-1718

Cell Phone: 202-641-0055

Sent from my iPhone

On Oct 17, 2019, at 8:10 AM, Scott, Mark <mark_scott@nps.gov> wrote:

Anytime Friday works for me. Thanks

Mark

On Thu, Oct 17, 2019 at 8:09 AM Said, Maria <maria_said@nps.gov> wrote:

Laura, Kurt, and Mark,

Is there a time on Friday that works better for you both?

Thanks.

Maria

On Wed, Oct 16, 2019 at 2:02 PM Said, Maria
<maria_said@nps.gov> wrote:

I can be there for any of those times. Thanks Jessica.

Maria

On Wed, Oct 16, 2019 at 1:34 PM Smith, Jessica
(CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

Hi NPS colleagues,

Currently it looks like we're free for a follow-up call on Friday, 10/18 at 10 am and 12 pm ET. We may be able to make 2 pm work as well, I just need to confirm with Claressa when she's back in office tomorrow am. Please let me know if any of those times work for you... if not we can move things around as needed to accommodate.

Thanks,
Jessica

—

Jessica C. Smith, MPH

Epidemiologist | Centers for Disease Control and Prevention

NCIRD/DBD/Respiratory Diseases Branch

404.718.5205 lyd7@cdc.gov

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, October 16, 2019 10:06 AM
To: Said, Maria <maria_said@nps.gov>
Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Miller, Laura <laura_a_miller@nps.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Sara Newman <sara_newman@nps.gov>; Mark Scott <Mark_Scott@nps.gov>
Subject: Re: [EXTERNAL] RE: Hot Springs - Culture results

Thanks Maria and Everyone,

I have actually already sent a meeting invite with the following number.

1-877-951-8306 access code 9958772

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✘

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On Wed, Oct 16, 2019 at 9:03 AM Said, Maria <maria_said@nps.gov> wrote:

Great -- thank you all for making the time.

Kurt, Laura, and I can all be on a call at 10am CT/11am ET.

Here is conference line info - 1-866-723-8146 PC 7713400.
I'll send out a calendar invite too.

Maria

On Wed, Oct 16, 2019 at 10:01 AM Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov> wrote:

Hello everyone,

I am sorry for the confusion. **CDC team is available 10am central today.**

Thank you,

Sooji

From: Miller, Laura <laura_a_miller@nps.gov>
Sent: Wednesday, October 16, 2019 9:44 AM
To: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
Cc: Kesteloot, Kurt <kurt_kesteloot@nps.gov>; Said, Maria <maria_said@nps.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>;

Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
<izk0@cdc.gov>; Ritter, Troy
(CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Sara
Newman <sara_newman@nps.gov>; Mark Scott
<Mark_Scott@nps.gov>
Subject: Re: [EXTERNAL] RE: Hot Springs - Culture
results

I can make 1:00 pm CDT.

Laura

On Wed, Oct 16, 2019 at 8:36 AM Lee, Sooji
(CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
wrote:

Hi Kurt,

It looks like some of our colleagues have a meeting at
10am central. Is there another time that may work for
your team today? We have availability 1pm, and 3pm
central today.

Best,

Sooji

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, October 16, 2019 8:48 AM
To: Said, Maria <maria_said@nps.gov>; Smith,
Jessica (CDC/DDID/NCIRD/DBD)
<lyd7@cdc.gov>; Lucas, Claressa
(CDC/DDID/NCIRD/DBD) <ch19@cdc.gov>; Kunz,
Jasen M. (CDC/DDNID/NCEH/DEHSP)
<izk0@cdc.gov>; Ritter, Troy
(CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>;

Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
<npf3@cdc.gov>
Cc: Laura Miller <laura_a_miller@nps.gov>; Sara
Newman <sara_newman@nps.gov>; Mark Scott
<Mark_Scott@nps.gov>
Subject: Re: Hot Springs - Culture results

Good Morning Everyone,

Are you available around 10 a.m. central time for a
call? If so, I can send a meeting invite.

Also, I have attached water use and temperatures for
our discussion.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior
Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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On Wed, Oct 16, 2019 at 6:24 AM Kesteloot, Kurt
<kurt_kesteloot@nps.gov> wrote:

Good Morning Everyone,

I emailed the lab last night requesting the temperatures. I know Mark Scott was present when samples were taken. I believe he mentioned that all samples had a temperature except the cooled thermal water reservoir.

I also requested the water meter readings for each facility. The park has water meter readings for both the cooled and hot thermal water at each location. I look forward to talking to everyone soon. I am open up to 1330 eastern time today.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior
Regions 3-5
National Park Service, Office of Public Health
(OPII),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

×

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On Tue, Oct 15, 2019 at 9:21 PM Said, Maria <maria_said@nps.gov> wrote:

Hi everyone,

We have received results of the Legionella testing at Hot Springs (attached).

Would you all have availability tomorrow to discuss?

We are not sure what to make of the detection in the hot samples (and can see if they have temperature readings from those water samples to see what the temperature actually was). We also are not sure what to make of the TimeZero vs. Standard ISO results.

Thank you as always for your help sorting through this. It is very much appreciated.

Maria

--

Laura A. Miller

Superintendent

Hot Springs National Park

101 Reserve Street
Hot Springs, AR 71901

501.623.2824
870.302.9250 (cell)
501.624.1037 (fax)

www.nps.gov/hosp

✕

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Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health |
National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 Washington,
DC 20240

Office Tel: 202-513-7151 | Email: maria_said@nps.gov

Website (public): <https://www.nps.gov/orgs/1878/index.htm>

Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

--

Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National
Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240

Office Tel: 202-513-7151 | Email: maria_said@nps.gov

Website (public): <https://www.nps.gov/orgs/1878/index.htm>

Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

--

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Service

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Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

--

Mark C. Scott

Facility Manager

Hot Springs National Park

631 Whittington Ave.

Hot Springs, AR 71901

(501)620-6861

--

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--

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Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Allison James
Sent: 18 Sep 2019 18:44:00 +0000
To: Kesteloot, Kurt; Said, Maria; Terry Paul
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD); Cooley, Laura A. (CDC/DDID/NCIRD/DBD); Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Lucas, Claressa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: RE: [EXTERNAL] RE: Hot Springs and Water management plans

That week is pretty open for me, too! I'm looping Terry Paul in on this thread also.

~Allison

Allison E. James, DVM, MPH, PhD
CDC Epidemic Intelligence Service Field Officer
Arkansas Department of Health
Allison.James@Arkansas.gov or hwj7@cdc.gov
Phone: (501) 614-5278
Fax: (501) 661-2300

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Wednesday, September 18, 2019 12:49 PM
To: Said, Maria <maria_said@nps.gov>
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Allison James <Allison.James@arkansas.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>
Subject: Re: [EXTERNAL] RE: Hot Springs and Water management plans

I'm fairly open that week and look forward to talking more. Should we invite a couple people from the Park?

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
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Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x

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On Wed, Sep 18, 2019 at 11:45 AM Said, Maria <maria_said@nps.gov> wrote:

Fantastic.
Tuesday 10/1 is wide open for me too.
The rest of that week I'll be at the IDSA conference and could step out if need be, but it would be less ideal.
Thank you!
Maria

On Wed, Sep 18, 2019 at 11:23 AM Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

Hi Maria,

We're happy to reconvene to discuss WMPs at Hot Springs. Starting tomorrow Troy is going to be traveling internationally, but he's back in the office on the 30th if we could shoot for a time that week? I'm also looping in Jasen and Claressa in case they can join too, since they bring the ASHRAE perspective and Claressa may be able to speak to the ecology of *Legionella* in this setting.

Right now it looks like Tuesday, 10/1 is wide open for us. Thurs, 10/3 we're free at 3:00 pm and then Friday, 10/4 at 1:00 pm and 3:00 pm ET.

Also, I was hoping we would have heard back from colleagues in Japan by now about any public health recommendations they have for similar settings, but unfortunately we haven't. I do think by the week of the 30th I should be able to do a quick lit review about cases and clusters associated with hot springs and can share any pertinent findings during the call.

Thanks,
Jessica

—

Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NCIRD/DBD/Respiratory Diseases Branch
404.718.5205 | lyd7@cdc.gov

From: Said, Maria <maria_said@nps.gov>

Sent: Wednesday, September 18, 2019 9:22 AM

To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP)

<tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Subject: Hot Springs and Water management plans

Hi Laura, Jessica, and Troy,

We (NPS and Arkansas) are trying to figure out the best path forward with the Hot Springs legionella cases. As you know, all the environmental testing has been negative. However, we have had a number of travel-related cases, and, based on Arkansas state data, it looks like there might be increased cases in the Hot Springs area generally compared to the rest of the state -- although these data are still being analyzed, and I would leave it to Arkansas to confirm this.

We also have considered more where the hot spring water is going -- apparently, it does not just go to the Quapaw, but it goes to a number of other concession operated businesses (including another spa) as well businesses outside park property (including a hospital therapeutic pool and at least one other hotel). One action we are considering is sending a letter to those who receive spa water and basically recommending that although we have never identified legionella in the water and don't know of any increased risk, we do know that untreated water does pose a risk for legionella growth, and businesses might want to consider a water management plan. My feeling is that it would be beneficial to them, if we have an additional case, to then be able to clearly describe their water system and the results of some pre-determined parameters (such as temperatures) over time.

If you all are available at any time, I would love to get your thoughts. Some questions I have are:

- Is a water management plan appropriate even for those buildings that don't meet ASHRAE building guidance criteria?
- Is a water management plan needed for only places that don't disinfect? I know that water management plans are used by many systems in which chlorine is used, but in this case, in which we don't have any evidence of Legionella growth in the hot spring water, I don't think we can or should point to hot spring water as a particular Legionella risk -- the risk in my mind is just from the fact that it is not disinfected.
- Should any of the water management plans include legionella testing? I think the Quapaw might consider this -- but then what would be the guidance if they get positive results?

I am including Allison, the new EIS officer for Arkansas on the thread. Dirk Haselow is no longer with the state health department.

Thanks for any thoughts on this. Hope you guys are well.

Maria

--

Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
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Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Kesteloot, Kurt
Sent: 18 Sep 2019 12:48:35 -0500
To: Said, Maria
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD); Cooley, Laura A. (CDC/DDID/NCIRD/DBD); Ritter, Troy (CDC/DDNID/NCEH/DEHSP); James, Allison (CDC arkansas.gov); Lucas, Claressa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] RE: Hot Springs and Water management plans

I'm fairly open that week and look forward to talking more. Should we invite a couple people from the Park?

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
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Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

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On Wed, Sep 18, 2019 at 11:45 AM Said, Maria <maria_said@nps.gov> wrote:

Fantastic.

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Jessica

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Jessica C. Smith, MPH

Epidemiologist | Centers for Disease Control and Prevention

NCIRD/DBD/Respiratory Diseases Branch

404.718.5205 | lyd7@cdc.gov

From: Said, Maria <maria_said@nps.gov>

Sent: Wednesday, September 18, 2019 9:22 AM

To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>

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Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Said, Maria
Sent: 18 Sep 2019 12:45:26 -0400
To: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Cc: Cooley, Laura A. (CDC/DDID/NCIRD/DBD); Ritter, Troy (CDC/DDNID/NCEH/DEHSP); James, Allison (CDC arkansas.gov); Kesteloot, Kurt; Lucas, Claressa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] RE: Hot Springs and Water management plans

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From: Said, Maria
Sent: 18 Sep 2019 15:00:52 -0400
To: Kesteloot, Kurt
Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD); Cooley, Laura A. (CDC/DDID/NCIRD/DBD); Ritter, Troy (CDC/DDNID/NCEH/DEHSP); James, Allison (CDC arkansas.gov); Lucas, Claressa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: Re: [EXTERNAL] RE: Hot Springs and Water management plans

Hi Kurt,

I think the call will focus on water management plans -- if you think the park would be interested in being part of that discussion, I think it would be fine. We can add Laura Miller and whoever else might be interested in the calendar invite once we have a day/time.

Maria

On Wed, Sep 18, 2019 at 1:49 PM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:
I'm fairly open that week and look forward to talking more. Should we invite a couple people from the Park?

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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From: Kesteloot, Kurt
Sent: 23 Oct 2019 22:23:21 -0500
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Smith, Jessica (CDC/DDID/NCIRD/DBD);Said, Maria;Mark Scott;Terry.Paul@arkansas.gov;Richard.McMullen@arkansas.gov
Cc: Miller, Laura;Sara Newman
Subject: Re: [EXTERNAL] Study of Legionella and Cl Contact Time
Attachments: HOSP_Uilities Drawings text.pdf, Legionella Testing Plan 10-23-19.xlsx, Susceptibility of LP to Cl in Tap Water.pdf

Good Evening Everyone,

Thank you for the assistance today. It was great to talk about the need for additional testing at Hot Spring National Park. It was also good to share the plan to try to reduce water age were possible. The park plans to take a temperature at the top of the cooled water storage tank and at the bottom from the drain and share with everyone.

When time permits, can you please look at the attached legionella testing plan to help understand if the NPS water system has legionella present. I have attached a drawing to help everyone understand the system and locations.

Meanwhile, it would be great to agree upon an appropriate contact time for NaOH chemical disinfection for a residual between 2 and 4 mg/L. CDR Troy Ritter was great and shared the attached study on contact time; however, it is for a lower residual. Currently, we have recommended 20-30 minutes; however, facilities have stated that is problematic.

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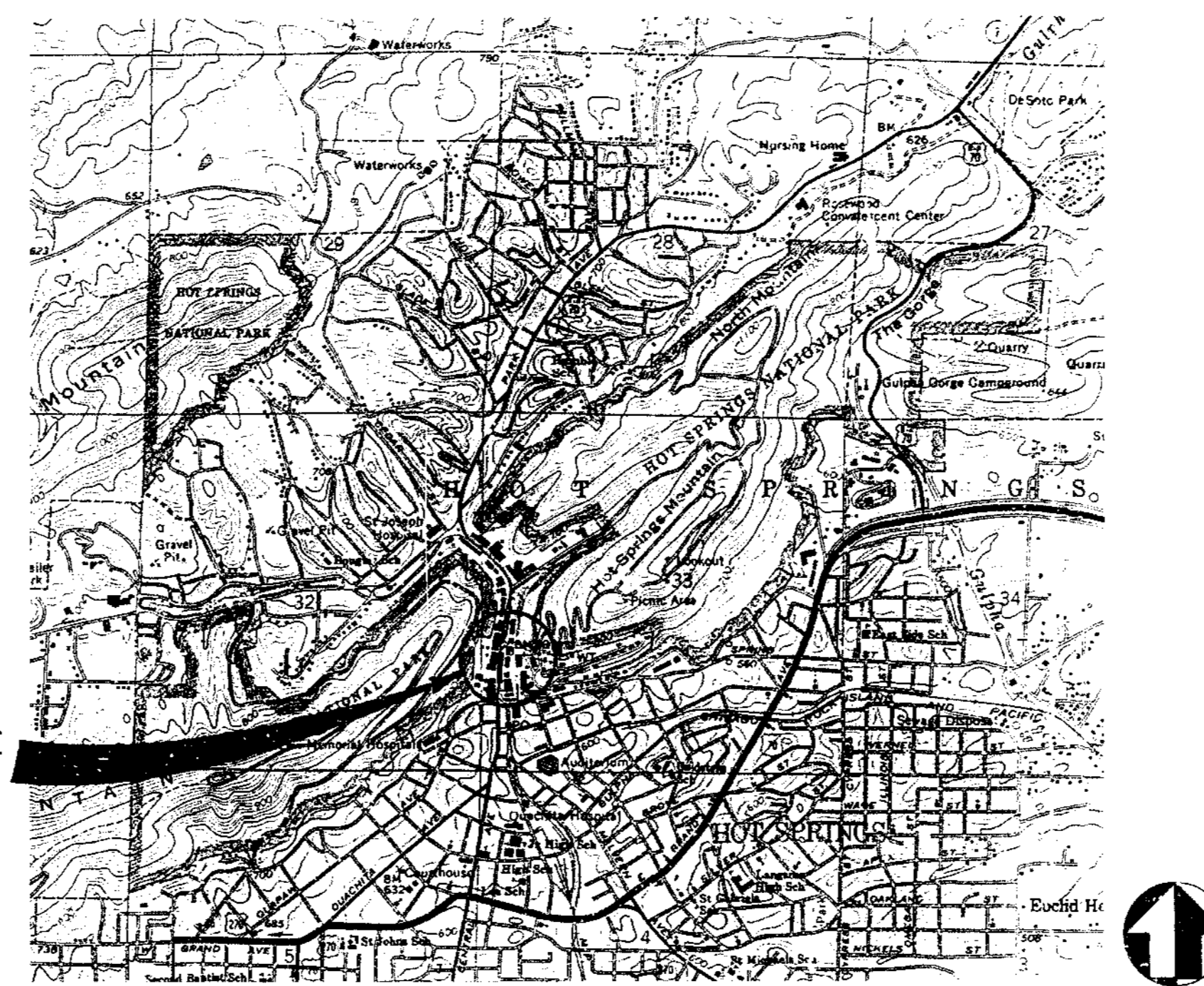
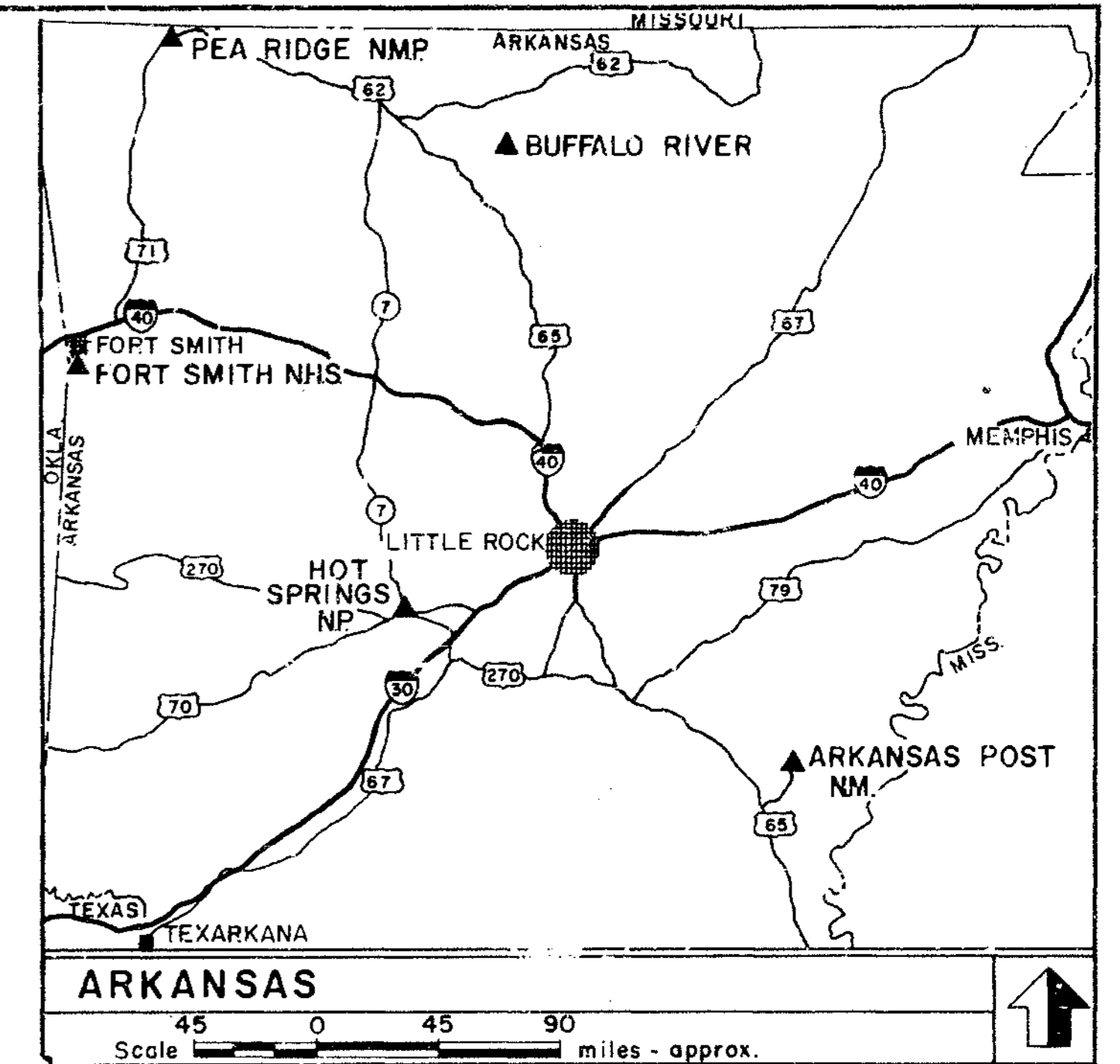
the parks that we share." GREEN DOT

Hot Springs National Park

Thermal Water Collection and Distribution System

GENERAL NOTES

1. LOCATIONS OF THE THERMAL WATER COLLECTION AND DISTRIBUTION SYSTEM AND APPURTENANCES WERE OBTAINED FROM SURFACE FIELD INSPECTIONS AND AS-BUILT DRAWINGS. NO SUB-SURFACE EXPLORATION WAS ATTEMPTED TO AVOID DISTURBANCES OF THE PARK.
2. SPRING FLOW RATES AND TEMPERATURES WERE MEASURED IN 1976 PRIOR TO CONSTRUCTION OF THE EXISTING COLLECTION SYSTEM.
3. ALL HW PIPE IS 6-INCH OR 10-INCH DIAMETER, 2-INCH FACTORY INSULATED (EXTERIOR), EPOXY LINED DUCTILE IRON PIPE CONVEYING HOT WATER.
4. ALL CW PIPE IS 6-INCH OR 8-INCH DIAMETER, EPOXY LINED, DUCTILE IRON PIPE CONVEYING COOLED WATER.
5. ALL CP PIPE IS 4-INCH, 6-INCH, OR 8-INCH DIAMETER CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPE CONVEYING HOT WATER. THE 4-INCH AND 6-INCH PIPE WAS INSTALLED INSIDE 6-INCH AND 8-INCH DIAMETER POLYVINYL CHLORIDE (PVC) PIPE, RESPECTIVELY.
6. ALL FCP PIPE IS 1/2-INCH, 2-INCH, 4-INCH, OR 6-INCH DIAMETER "SILVER THREAD" FIBERGLASS PIPE CONVEYING HOT WATER. THE 4-INCH AND 6-INCH PIPE WAS INSTALLED INSIDE 6-INCH OR 8-INCH DIAMETER ASBESTOS-CEMENT PIPE, RESPECTIVELY.
7. ALL TEMPERATURES SHOWN ARE DEGREES FAHRENHEIT.



VICINITY MAP
SCALE OF FEET

ABBREVIATIONS

- AC ASBESTOS CEMENT PIPE
- BM BENCHMARK
- CI CAST IRON PIPE
- CL CENTER LINE
- CONC CONCRETE
- CP COLLECTION PIPE
- CP COPPER PIPE
- CW COOLED WATER PIPE
- DIA DIAMETER
- EL ELEVATION
- ELEC ELECTRICAL
- FCP FIBERGLASS HOT WATER PIPE
- GAL GALLON
- GL GAS PIPELINE
- GPD GALLONS PER DAY
- GV GATE VALVE
- HW HOT WATER
- INCL INCLUDED
- MH MANHOLE
- PVC POLYVINYL CHLORIDE PIPE
- SS SANITARY SEWER
- STA STATION
- TBM TEMPORARY BENCHMARK
- VC VITRIFIED CLAY PIPE
- WL CITY WATER LINE

LEGEND

- | SYMBOL | DESCRIPTION |
|----------|-----------------------------|
| --- | HOT WATER PIPELINES |
| --- | COOLED WATER PIPELINES |
| ---++--- | ELECTRICAL CONDUIT |
| --- | SPRING COLLECTION PIPELINES |
| +++++ | GAS PIPELINES |
| ---v--- | VERTICAL WALL |

BATHHOUSE ROW

INDEX

1. COVER SHEET
2. ARLINGTON LAWN AREA
3. BATHHOUSE ROW-PLAN & PROFILE
4. BATHHOUSE ROW-PLAN & PROFILE
5. BATHHOUSE ROW-PLAN & PROFILE
6. UPPER RESERVOIR PIPELINE - PLAN & PROFILE
7. SPRING COLLECTION GROUP #2
8. SPRING COLLECTION GROUP #2
9. DETAILS
10. PROCESS AND INSTRUMENTATION DIAGRAMS
11. PROCESS AND INSTRUMENTATION DIAGRAMS
12. ONE LINE - ELECTRICAL

REFERENCE DRAWINGS

1. NP HS-4784 (1930)
2. NP HS-2043 (1948)
3. NP HS-5311C (1948)
4. 128 41,015A (1978)
5. 128 41,021A (1985)
6. 128 60,001 (1981)
7. 128 41,023B (1987)
8. 128 60,190 (1978)
9. 128 41,031A (1987)

REDUCED SIZE REPRODUCTION

Prepared by:

HYDRG-TRIAD, LTD.
1310 Wadsworth Blvd.
Suite 100
Lakewood, Colo. 80215

Mark	Sheet	REVISION	Date	Initial

This drawing has been prepared in compliance with Preliminary/Comprehensive Design Drawing No. _____

Approved by _____ on _____ Date _____

Title _____ Date _____

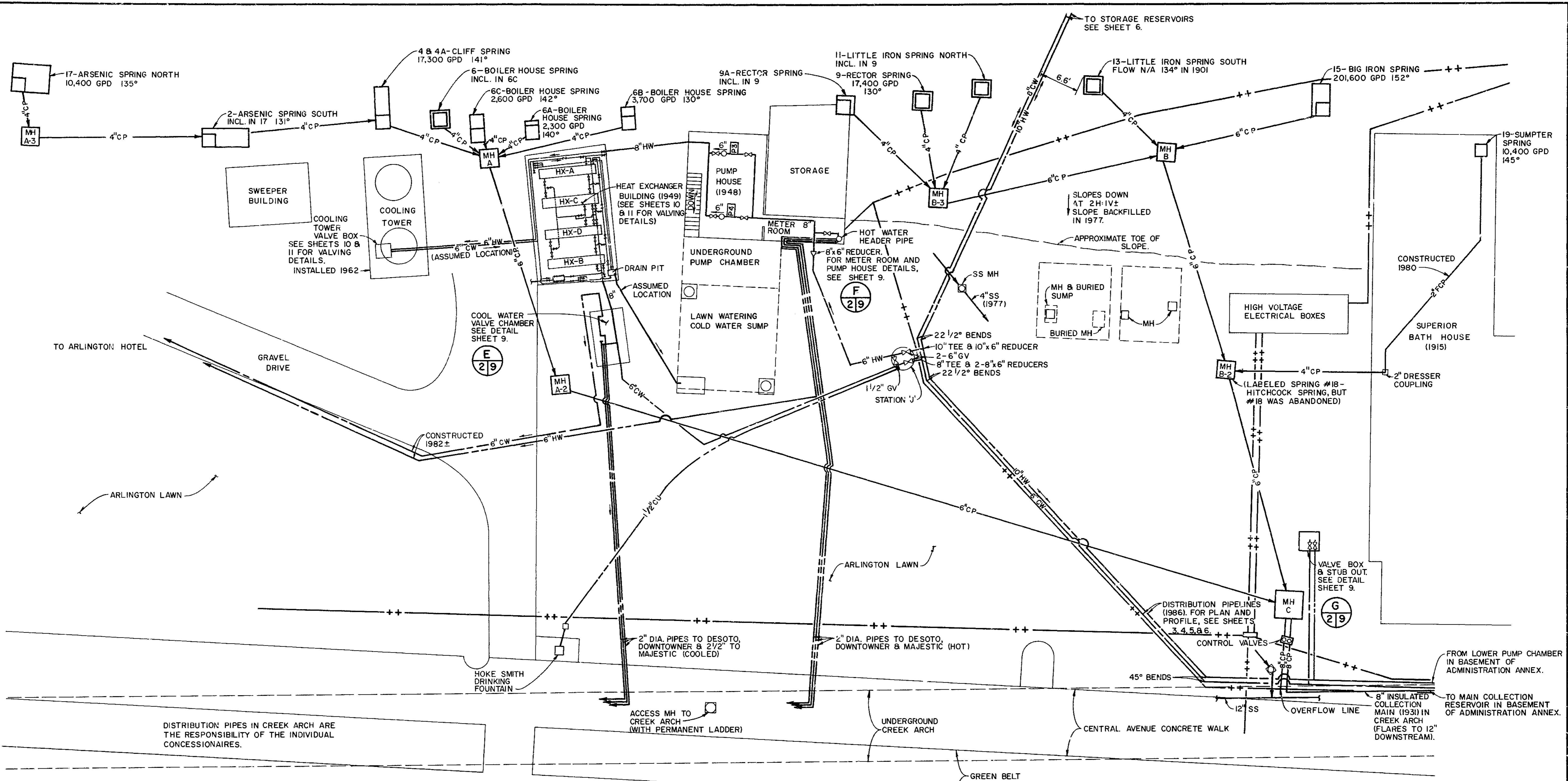
Assistant Manager Date _____

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
DENVER SERVICE CENTER

DESIGNED: JACOBS
DRAWN: MJNEIMES
TECH. REVIEW: _____
DATE: 4/1988

TITLE OF SHEET
EXISTING CONDITIONS OF THE THERMAL WATER COLLECTION & DISTRIBUTION SYSTEM
LOCATION WITHIN PARK
BATHHOUSE ROW
NAME OF PARK
HOT SPRINGS NATIONAL PARK
SOUTHWEST REGION GARLAND COUNTY ARKANSAS STATE

DRAWING NO. 128
4,035
PKG. NO. 1
SHEET NO. 1
OF 12



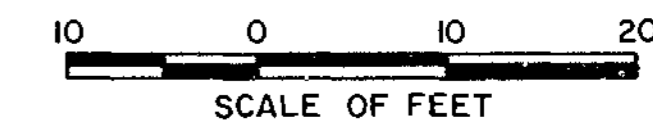
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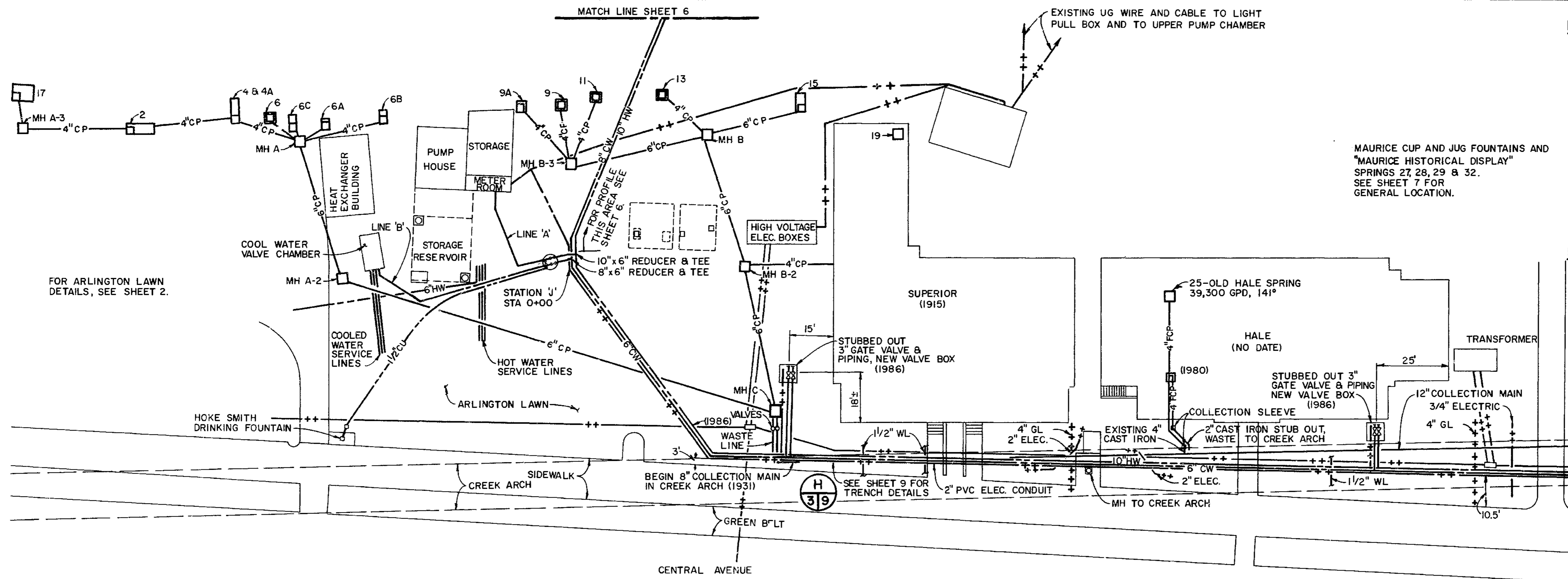
NOTES

- 1. SPRING BOXES AND COLLECTION PIPES THIS SHEET CONSTRUCTED 1977 EXCEPT AS NOTED.
- 2. DISTRIBUTION LINES CONSTRUCTED 1986.
- 3. ABANDONED OR PLUGGED LINES NOT SHOWN.

- 4. LAWN SPRINKLER SYSTEM NOT SHOWN, BUT CONSISTS OF GALVANIZED PIPE AND PLASTIC PIPE UNDER MOST OF ARLINGTON LAWN.
- 5. FOR LEGEND, GENERAL NOTES, AND ABBREVIATIONS, SEE SHEET 1.
- 6. LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.
- 7. VALVES, METERS, PUMPS, AND DISTRIBUTION PIPING ARE SHOWN ON THE PROCESS AND INSTRUMENTATION DIAGRAMS SHOWN ON SHEETS 10 AND 11.
- 8. ALL SPRINGS SHOWN ON THIS SHEET ARE COLLECTED.



DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET ARLINGTON LAWN AREA THERMAL WATER DISTRIBUTION SYSTEM AND SPRING GROUP #1 COLLECTION SYSTEM	DRAWING NO. 128 41,035
DRAWN: MJEIMES			PKG. NO. 2
TECH. REVIEW:			OF 12
DATE: 4/1998			

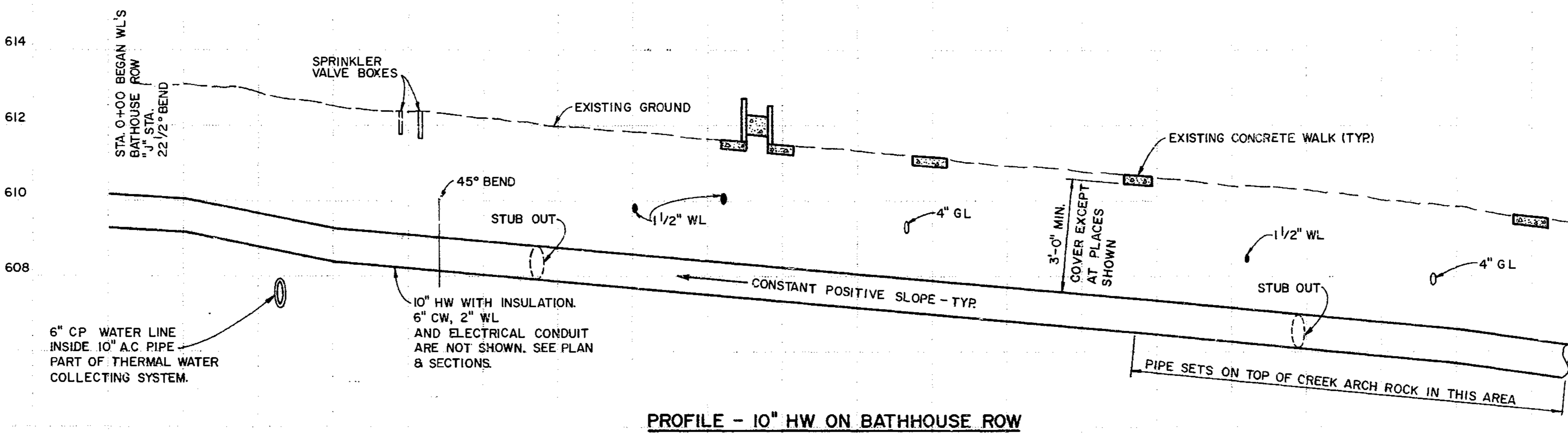
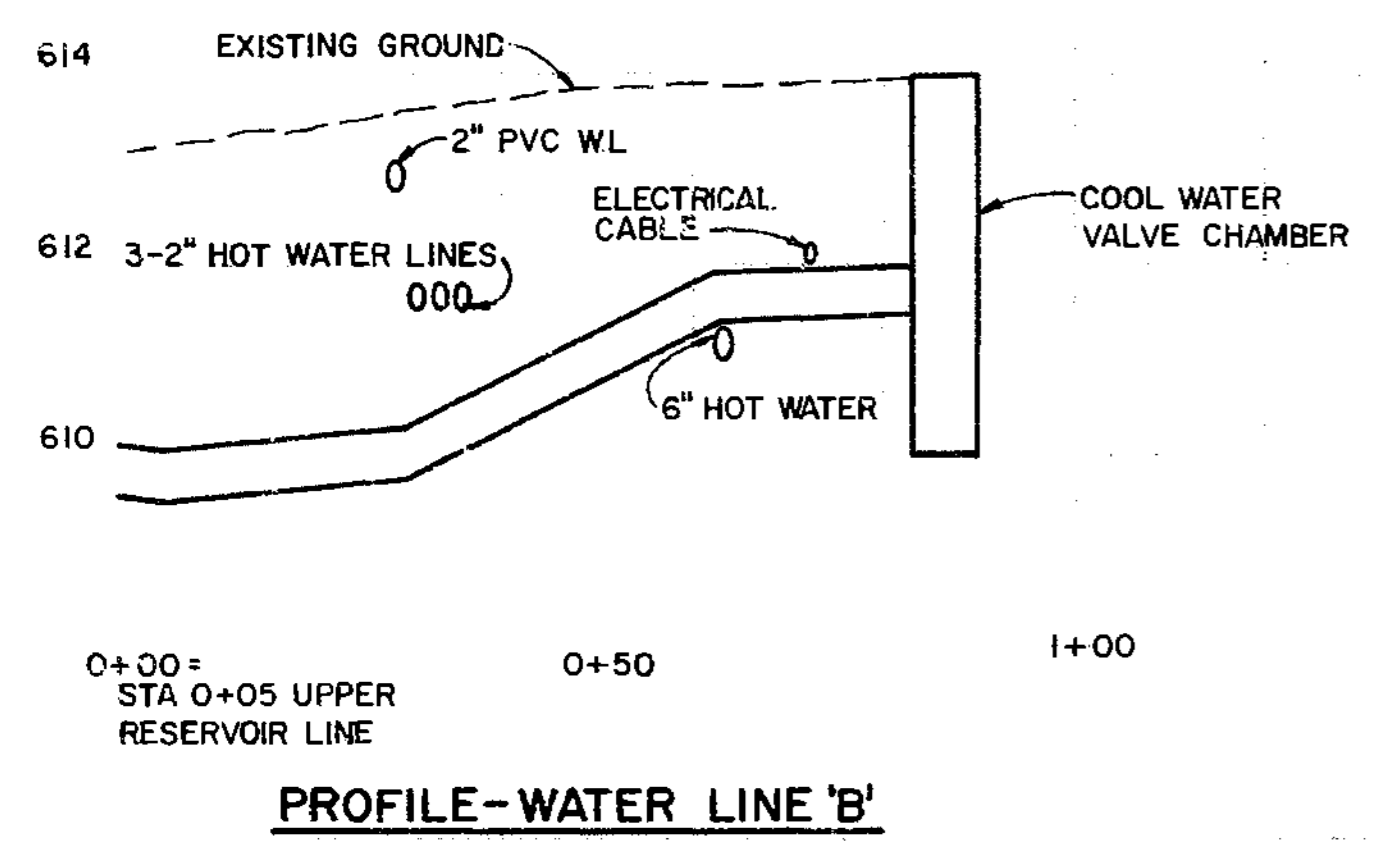
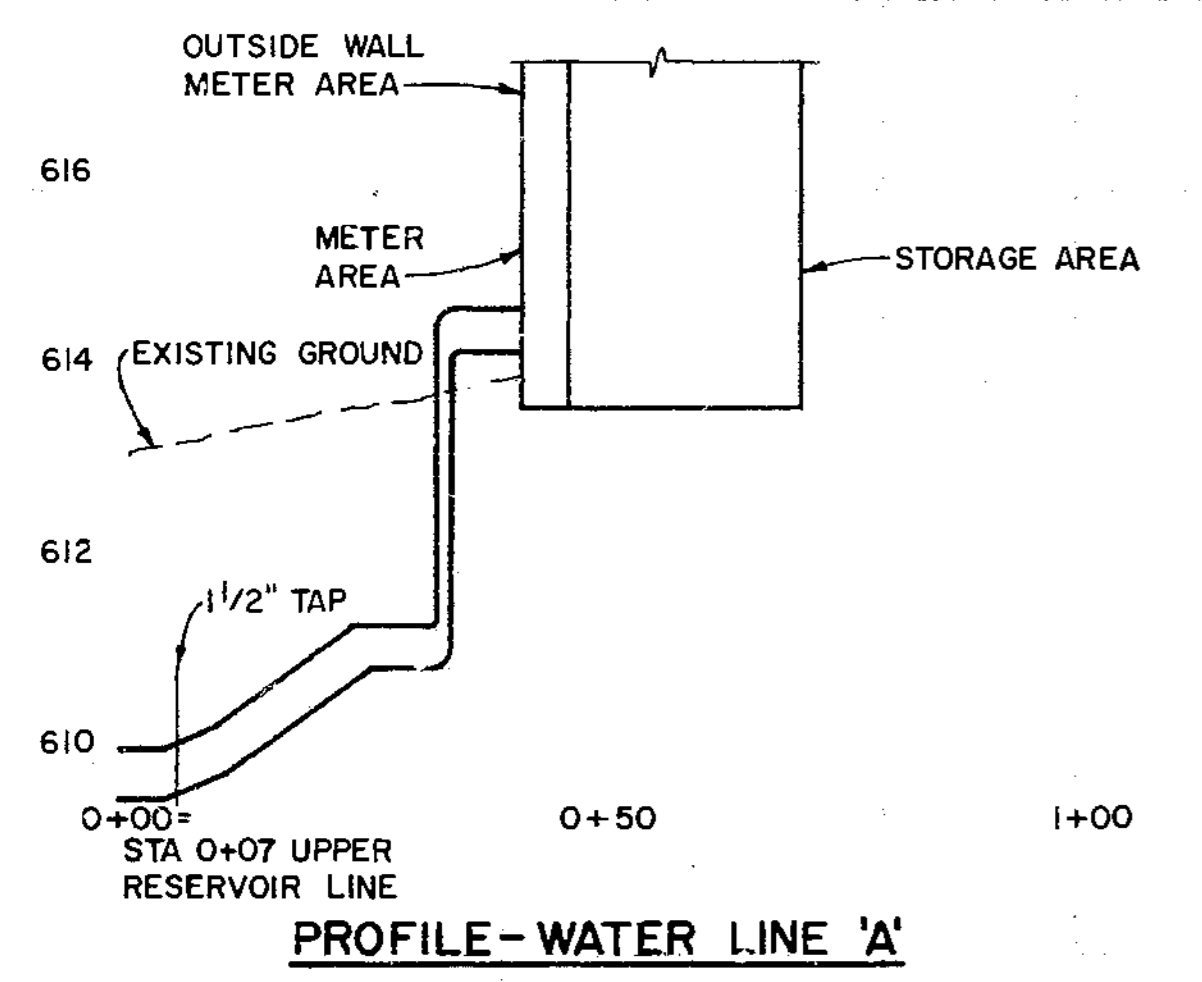
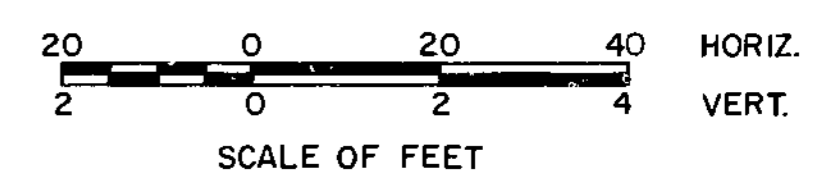


MAURICE CUP AND JUG FOUNTAINS AND "MAURICE HISTORICAL DISPLAY" SPRINGS 27, 28, 29 & 32. SEE SHEET 7 FOR GENERAL LOCATION.

- NOTES**
- FOR LEGEND, GENERAL NOTES, AND ABBREVIATIONS, SEE SHEET 1.
 - SPRING INFORMATION AND ADDITIONAL PIPING DETAILS SHOWN ON SHEET 2.
 - LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.
 - PLUGGED AND/OR ABANDONED PIPE NOT SHOWN.
 - FOR CLARITY, ALL VALVES AND METERS NOT SHOWN. FOR VALVING AND METERING DETAILS, REFER TO SHEETS 10 AND 11.

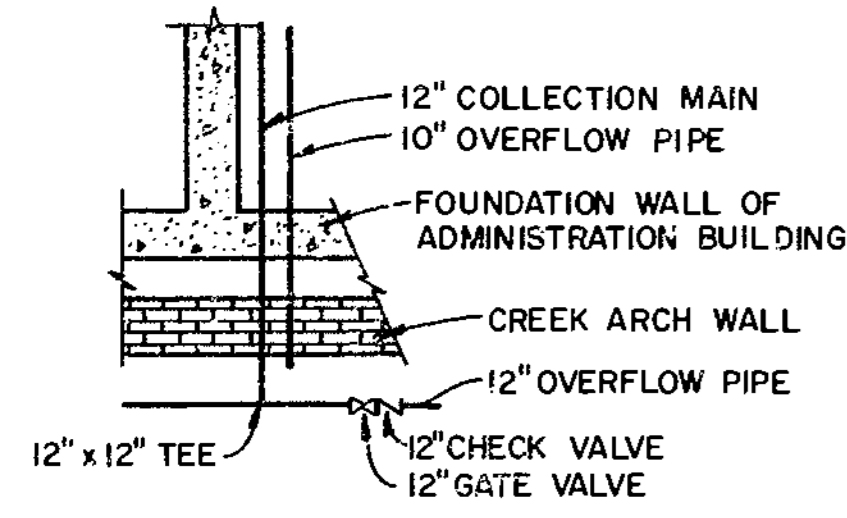
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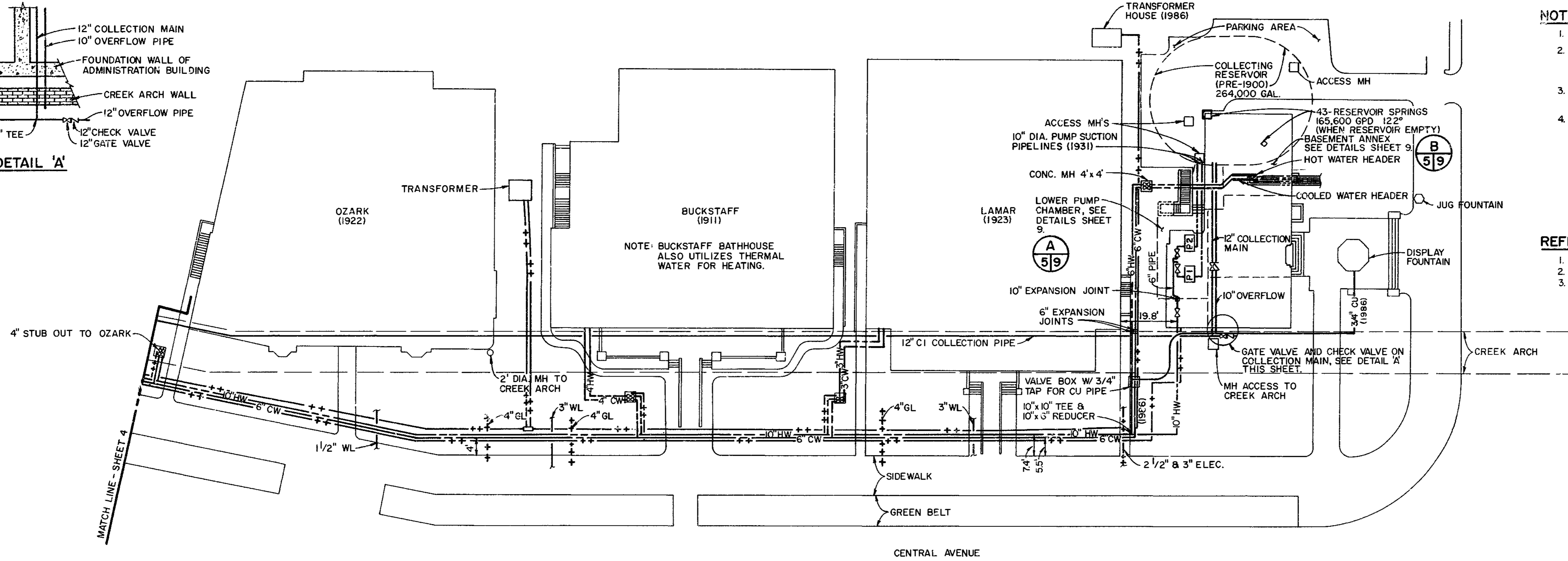


SEE DETAILS SHEET 9 FOR TYPICAL BATHHOUSE CONNECTIONS.

DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET		DRAWING NO.
DRAWN: M.J. NEIMES		BATHHOUSE ROW PLAN & PROFILE		128 41,035
TECH. REVIEW:				PKG. NO.
DATE: 4/1988				3
				OF 12



DETAIL 'A'

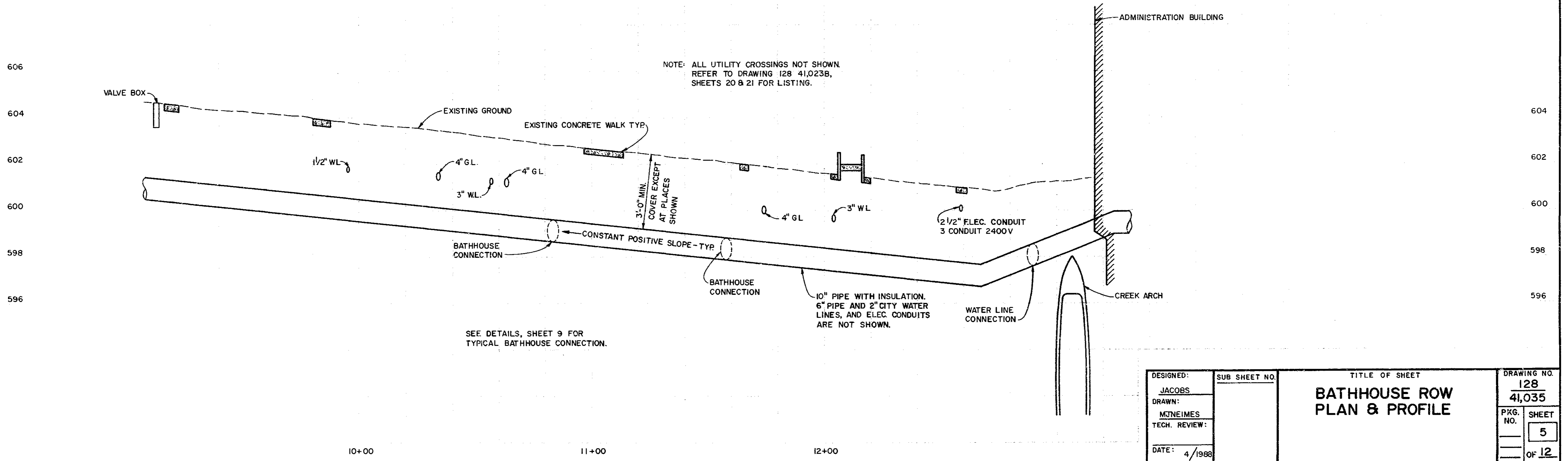
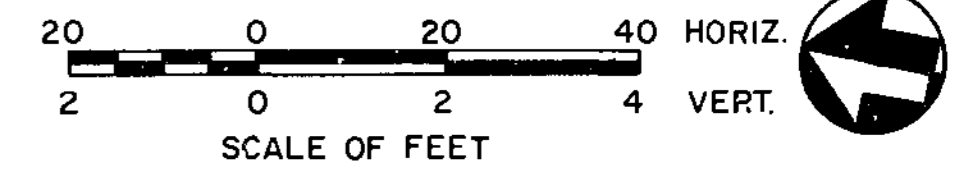


NOTES

1. PLUGGED AND/OR ABANDONED PIPE NOT SHOWN.
2. FOR CLARITY, ALL VALVES AND METERS NOT SHOWN FOR VALVING AND METERING DETAILS, REFER TO SHEETS 10 AND 11.
3. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS SEE SHEET 1.
4. LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.

REFERENCE DRAWINGS

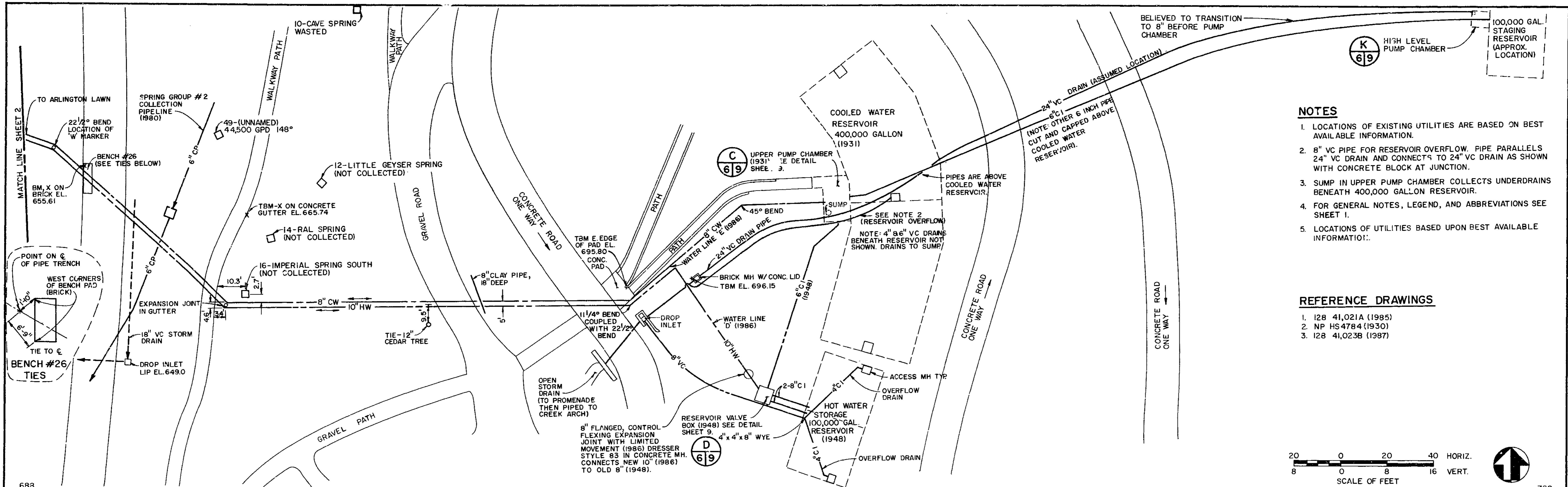
1. I28 41,021A (1985)
2. I28 41,023B (1987)
3. I28 41,031A (1987)



NOTE: ALL UTILITY CROSSINGS NOT SHOWN REFER TO DRAWING I28 41,023B, SHEETS 20 & 21 FOR LISTING.

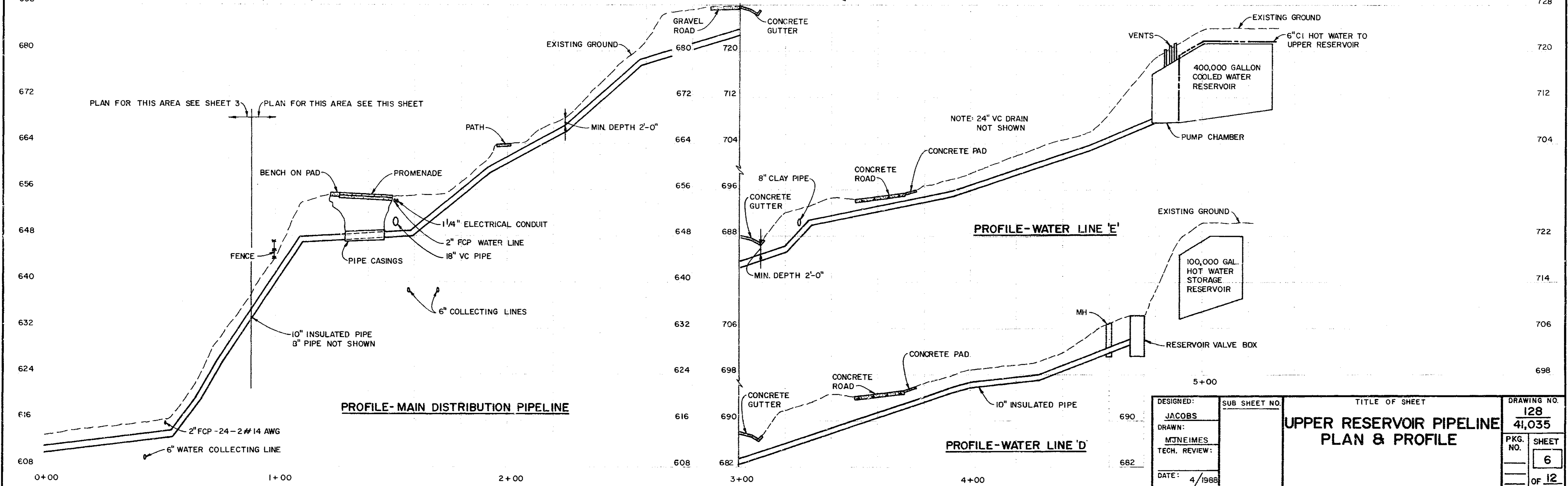
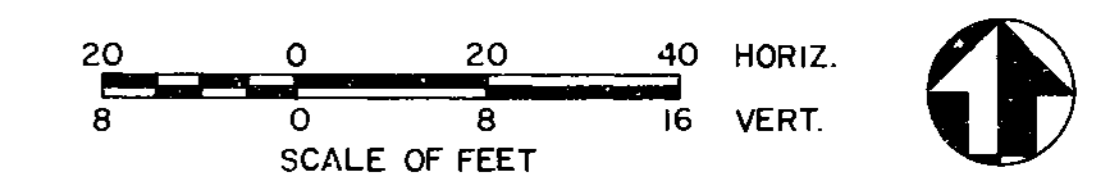
SEE DETAILS, SHEET 9 FOR TYPICAL BATHHOUSE CONNECTION.

DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET BATHHOUSE ROW PLAN & PROFILE	DRAWING NO. 128 41,035
DRAWN: MCNEIMES			PKG. NO.
TECH. REVIEW:			SHEET 5
DATE: 4/1988			OF 12



- NOTES**
1. LOCATIONS OF EXISTING UTILITIES ARE BASED ON BEST AVAILABLE INFORMATION.
 2. 8" VC PIPE FOR RESERVOIR OVERFLOW. PIPE PARALLELS 24" VC DRAIN AND CONNECTS TO 24" VC DRAIN AS SHOWN WITH CONCRETE BLOCK AT JUNCTION.
 3. SUMP IN UPPER PUMP CHAMBER COLLECTS UNDERDRAINS BENEATH 400,000 GALLON RESERVOIR.
 4. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS SEE SHEET 1.
 5. LOCATIONS OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.

- REFERENCE DRAWINGS**
1. I28 41,021A (1985)
 2. NP HS4784 (1930)
 3. I28 41,023B (1987)



DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET UPPER RESERVOIR PIPELINE PLAN & PROFILE	DRAWING NO. 128 41,035
DRAWN: MONEIMES			PKG. NO.
TECH. REVIEW:			SHEET 6
DATE: 4/1988			OF 12

NOTES

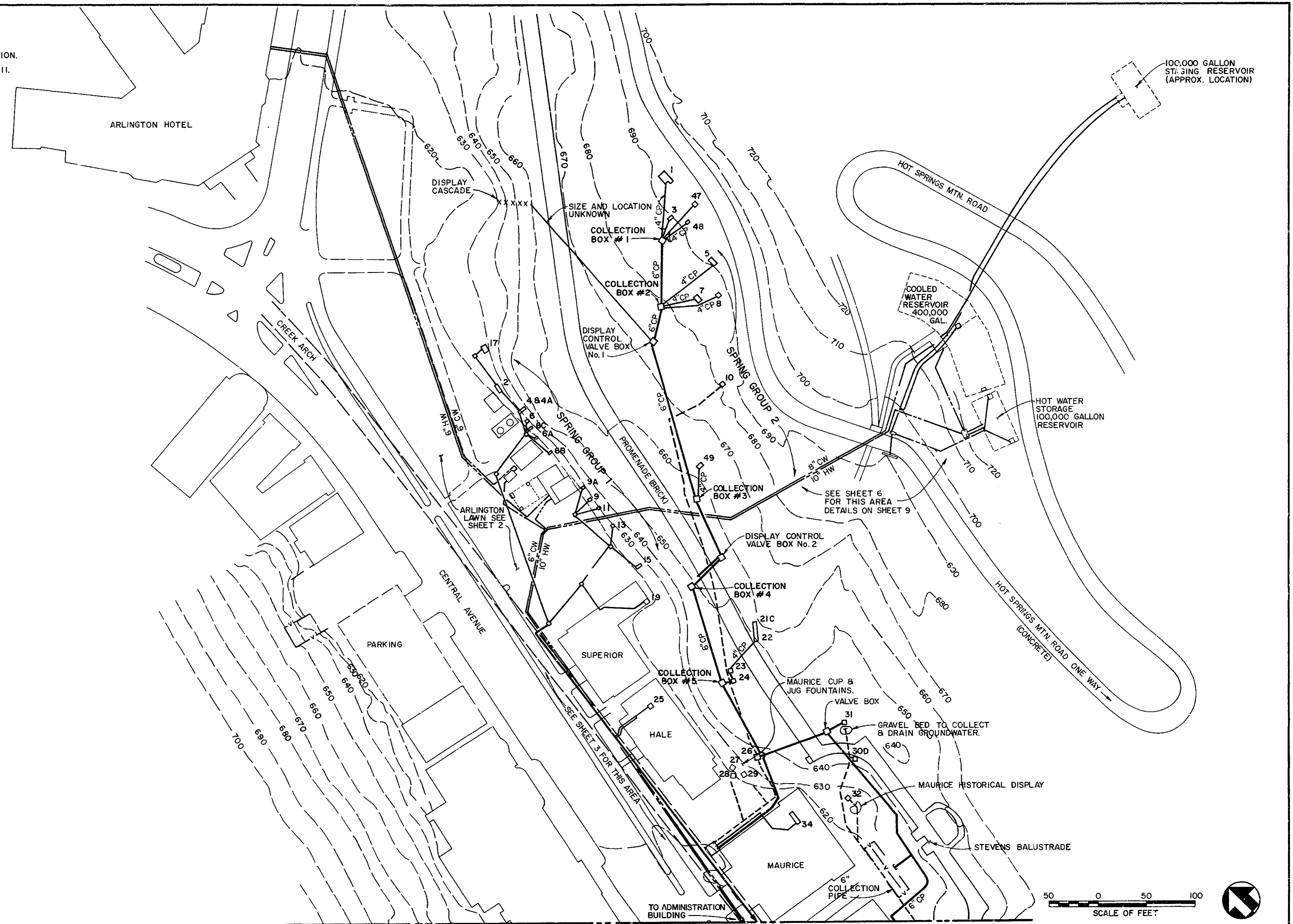
1. LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.
2. FOR VALVING AND METERING DETAILS, REFER TO SHEETS 10 AND 11.
3. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS, SEE SHEET 1.
4. SPRING GROUP 2 CONSTRUCTED 1980. SPRING GROUP 1 DETAILS GIVEN ON PREVIOUS SHEETS.
5. ABANDONED AND/OR PLUGGED LINES NOT SHOWN.
6. TOPOGRAPHY FROM DRAWINGS 128 41,021A (1985).

REFERENCE DRAWINGS

1. 128 41,015A (1978)
2. 128 41,021A (1985)
3. 128 41,023B (1987)
4. 128 60,001 (1981)

SPRING GROUP 2 INFORMATION

SPRING No.	SPRING NAME	FLOW (GPD)	TEMP (°F)
1	EGG SPRING	33,100	138°
3	ARLINGTON SPRING	28,800	140°
5	AVENUE SPRING	10,200	141°
7	IMPERIAL SPRING NORTH	3,300	139°
8	CRYSTAL SPRING	9,400	129°
10	CAVE SPRING		
21C	ALUM SPRING	900	
22	SUPERIOR SPRING SOUTH	2,900	
23	TWIN SPRING NORTH	1,400	145°
24	TWIN SPRING SOUTH	3,300	147°
26	PALACE SPRING	11,500	146°
30	ARCH SPRING		
31	HAYWOOD SPRING	21,000	136°
32	JOHN W. NOBLE SPRING		
47		28,300	148°
48		24,000	144°
49		44,500	148°



MATCH LINE SHEET 8

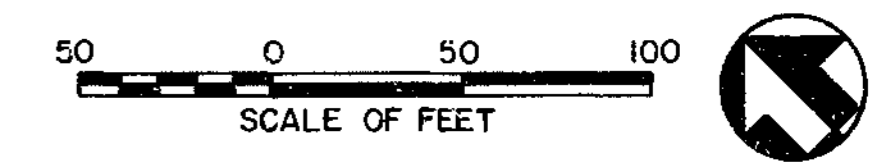
DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET SPRING COLLECTION GROUP #2 (NORTH HALF)	DRAWING NO. 128 41,035
DRAWN: MJNEIMES			PKG. NO.
TECH. REVIEW:			SHEET 7
DATE: 4/1988			OF 12

NOTES

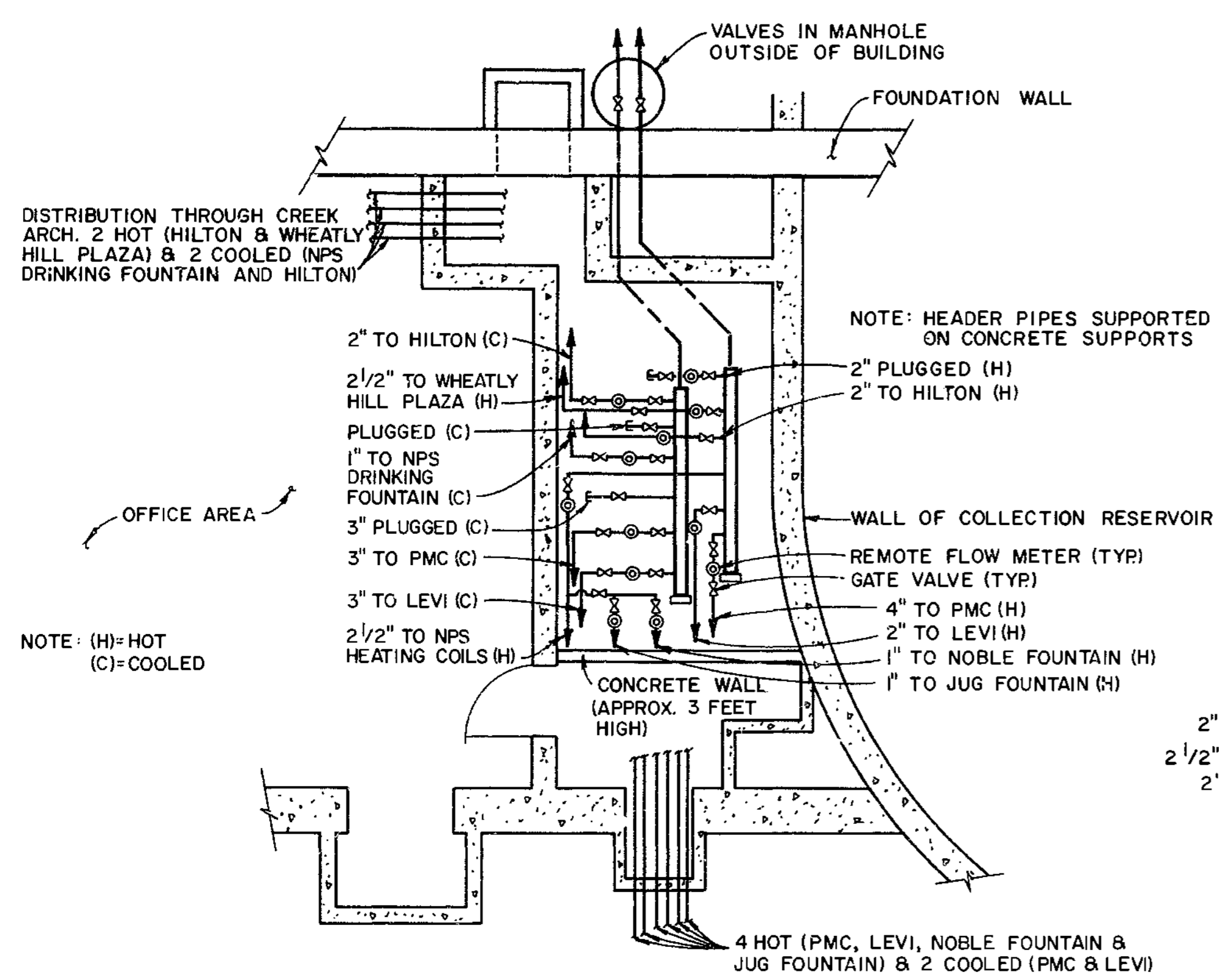
1. LOCATION OF UTILITIES BASED UPON BEST AVAILABLE INFORMATION.
2. FOR VALVING AND METERING DETAILS, REFER TO SHEETS 10 AND 11.
3. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS, SEE SHEET 1.
4. SPRINGS THIS SHEET CONSTRUCTED 1981.
5. ABANDONED AND/OR PLUGGED LINES NOT SHOWN.
6. TOPOGRAPHY FROM DRAWINGS 128 41,021 A (1985).
7. FOR SPRING INFORMATION, SEE SHEET 7.

REFERENCE DRAWINGS

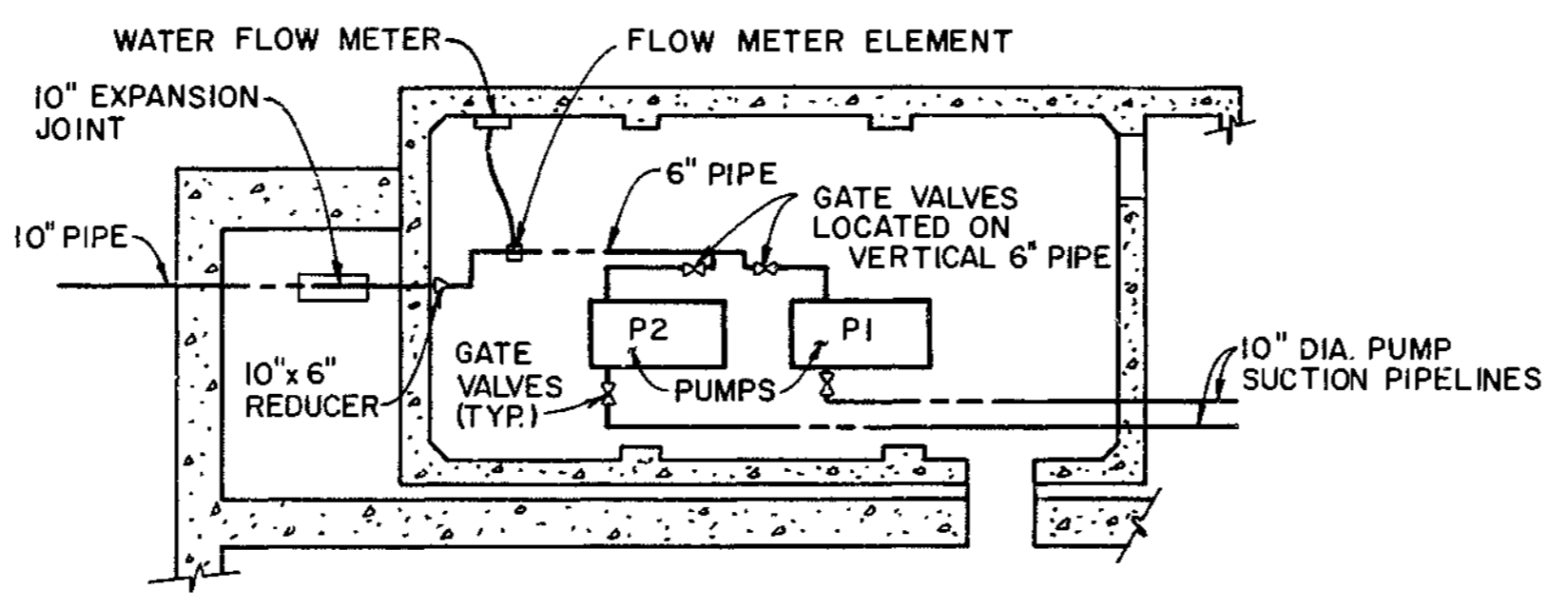
1. 128 41,015 A (1978)
2. 128 41,021 A (1985)
3. 128 41,023 B (1987)
4. 128 60,001 (1981)



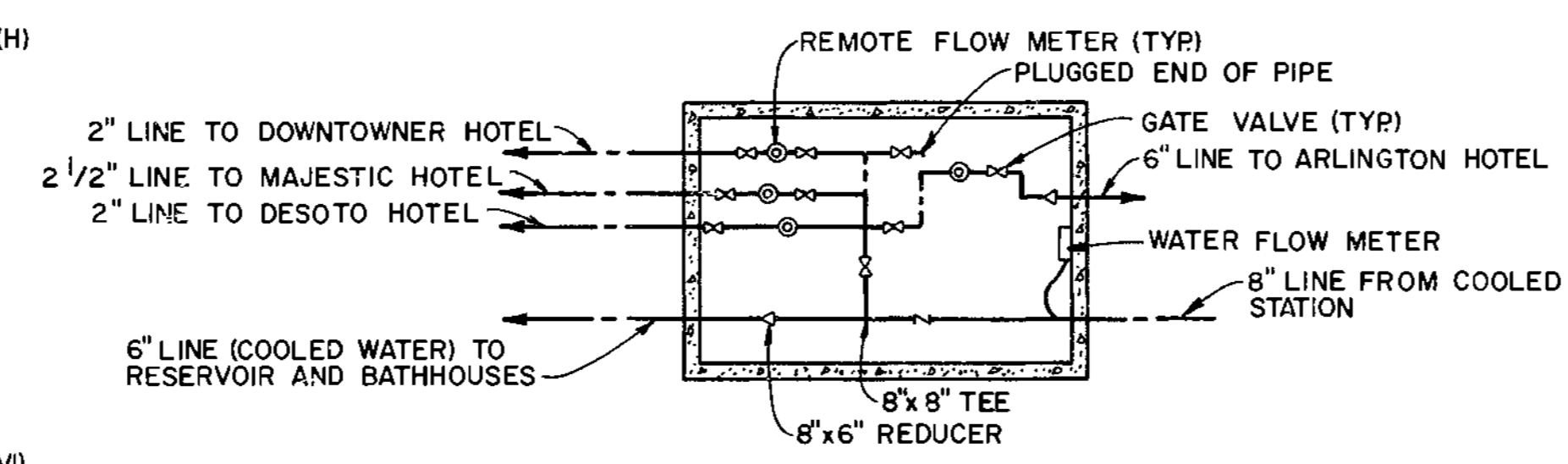
DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET SPRING COLLECTION GROUP #2 (SOUTH HALF)	DRAWING NO. 128 41,035
DRAWN: MJEIMES			PKG. NO. SHEET 8
TECH. REVIEW:			OF 12
DATE: 4/1988			



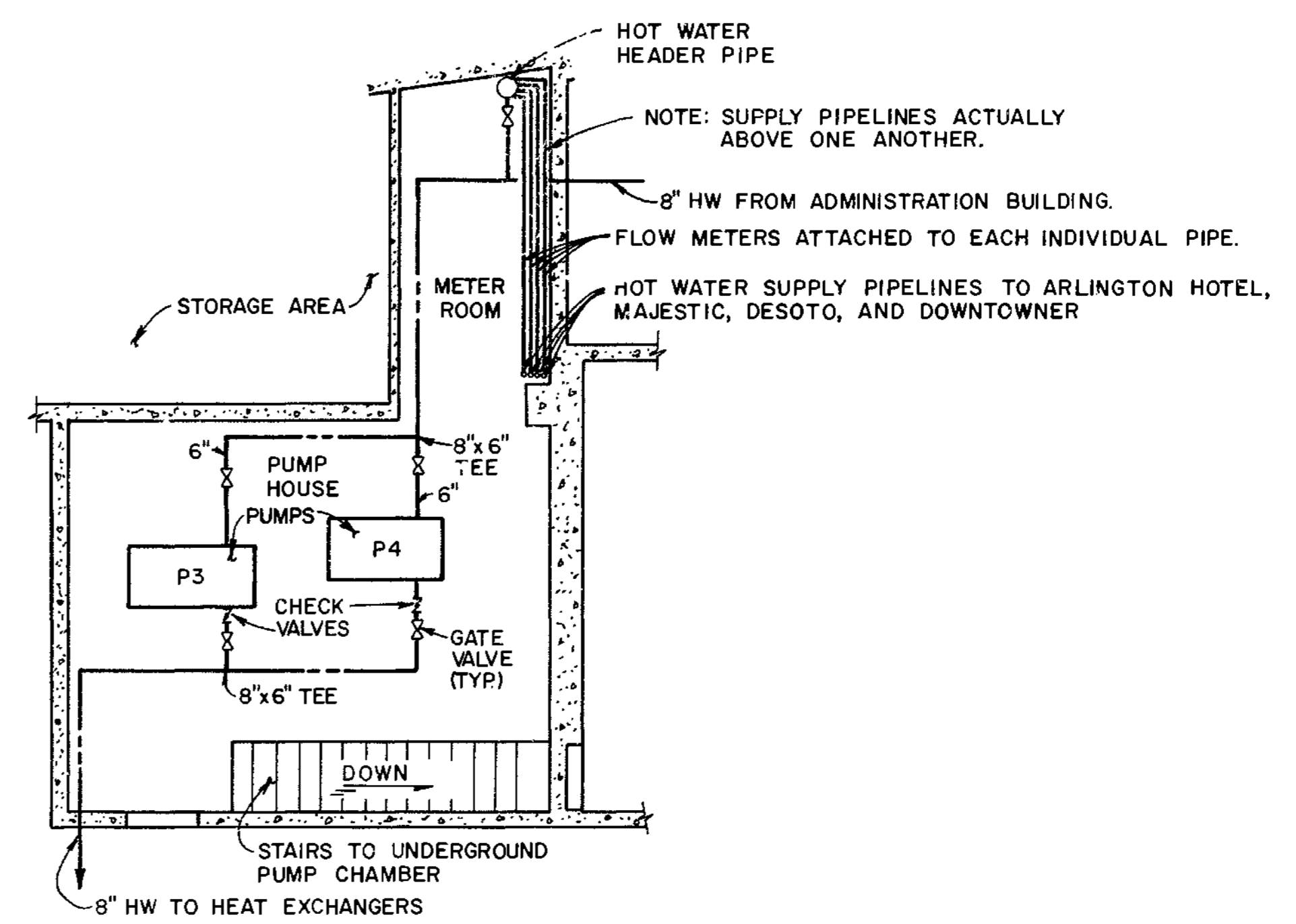
B BASEMENT ANNEX
SCALE: 1"=5'
↑



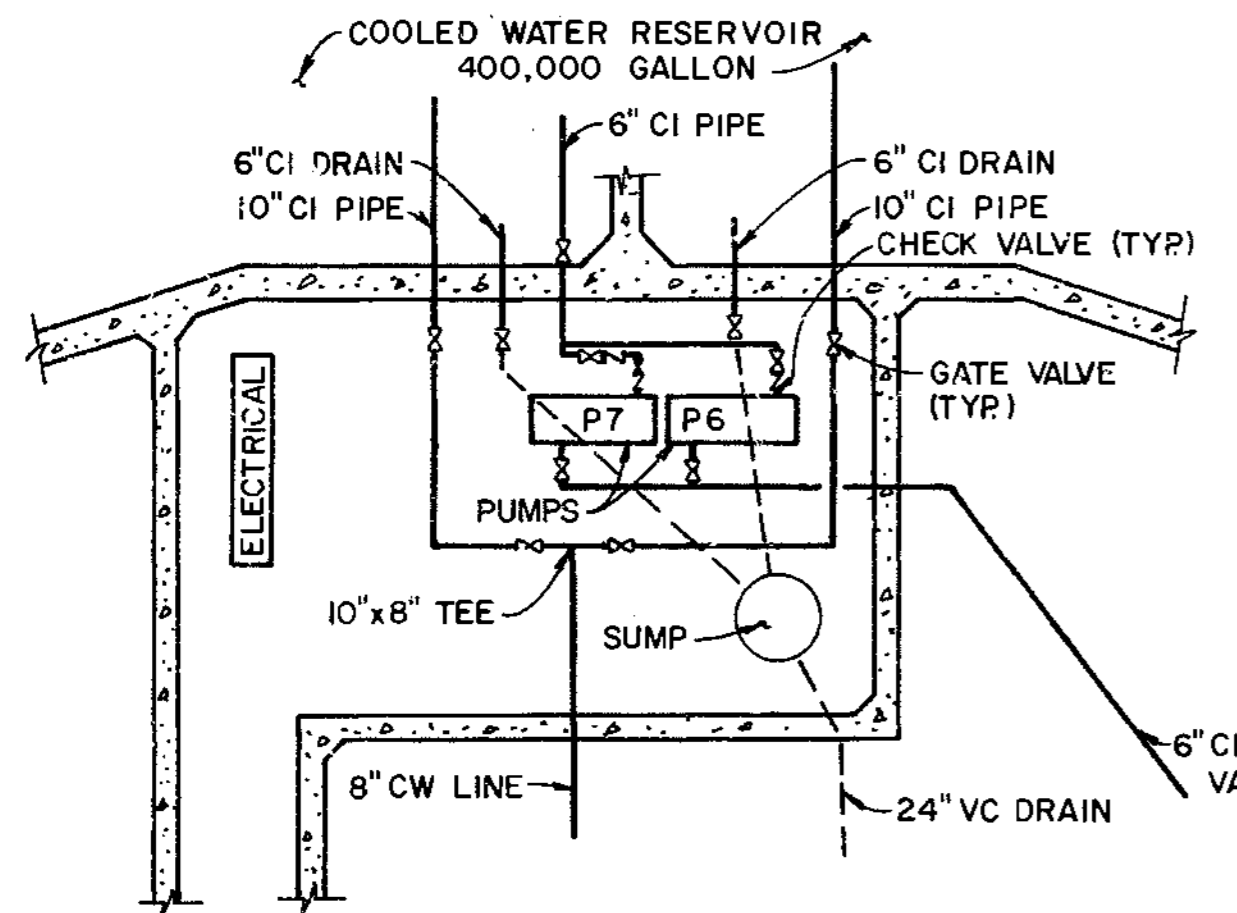
A LOWER PUMP CHAMBER
SCALE: 1"=8'
↑



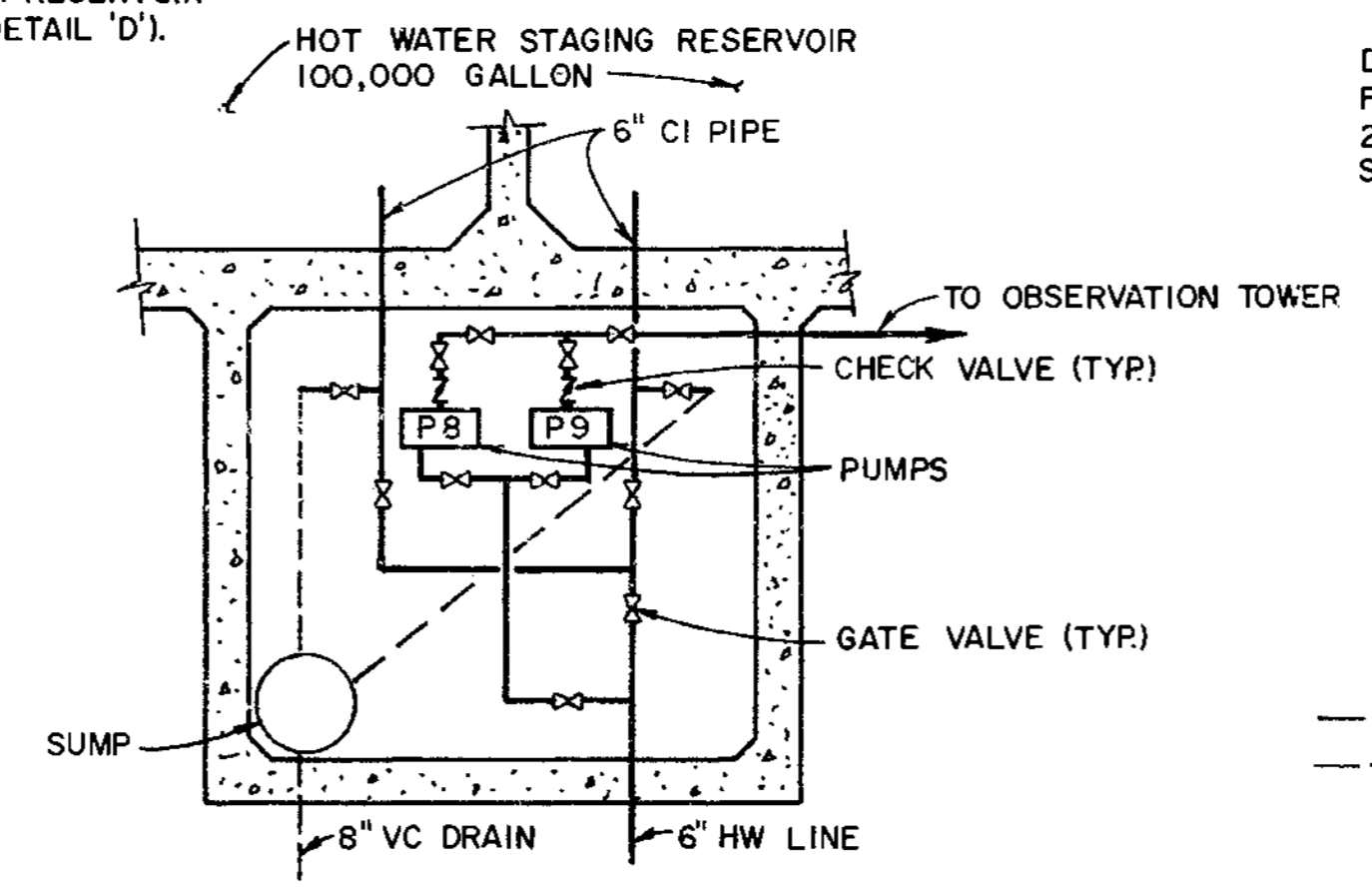
E COOLED WATER VALVE CHAMBER
SCALE: 1"=5'
↑



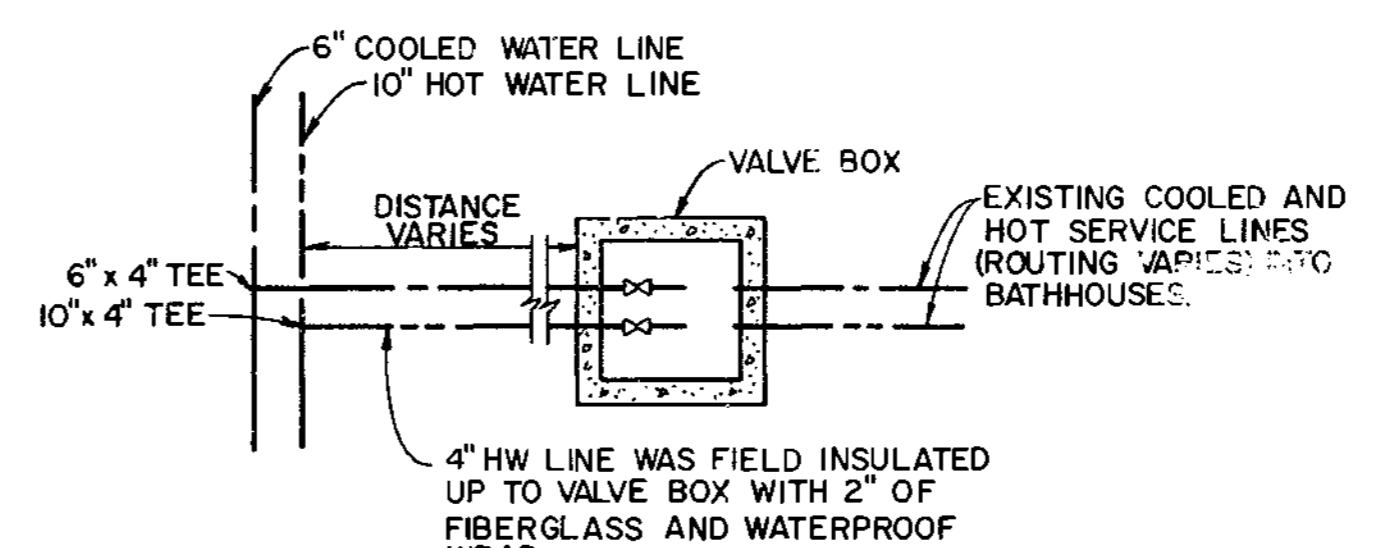
F PUMP HOUSE AND METER ROOM
SCALE: 1"=5'
↓



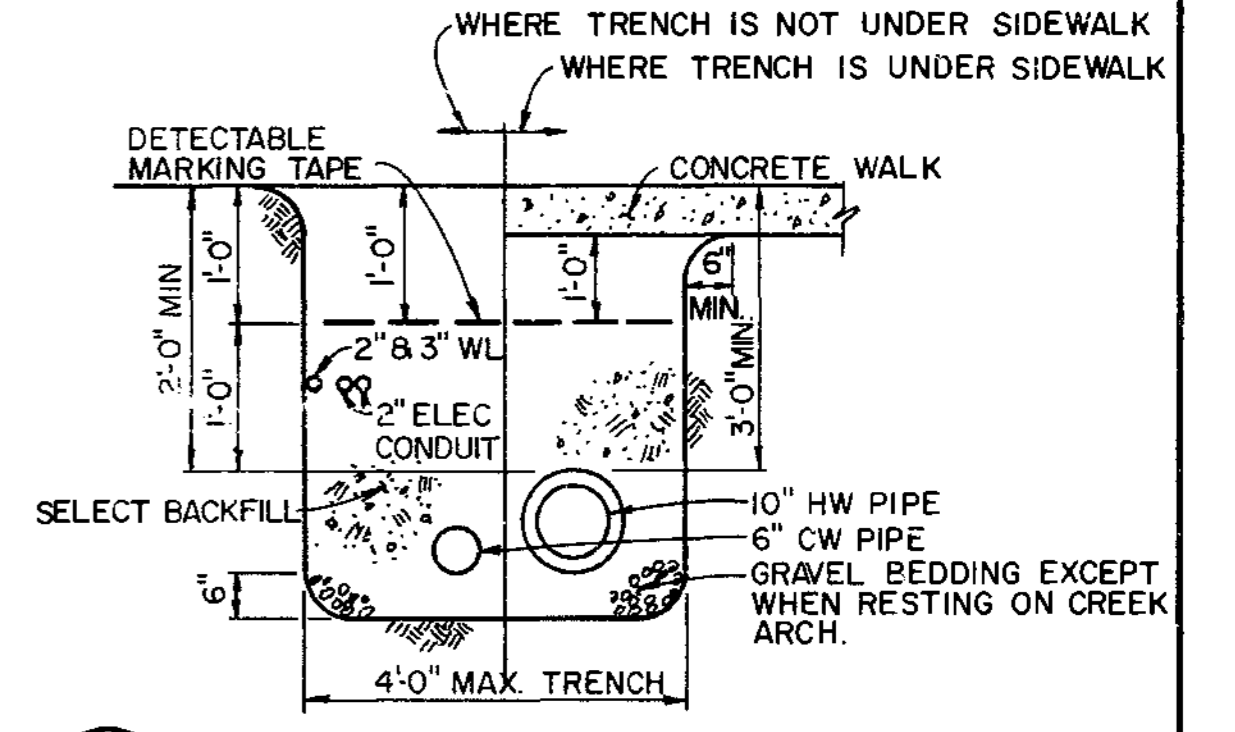
C UPPER PUMP CHAMBER
SCALE: 1"=5'
←



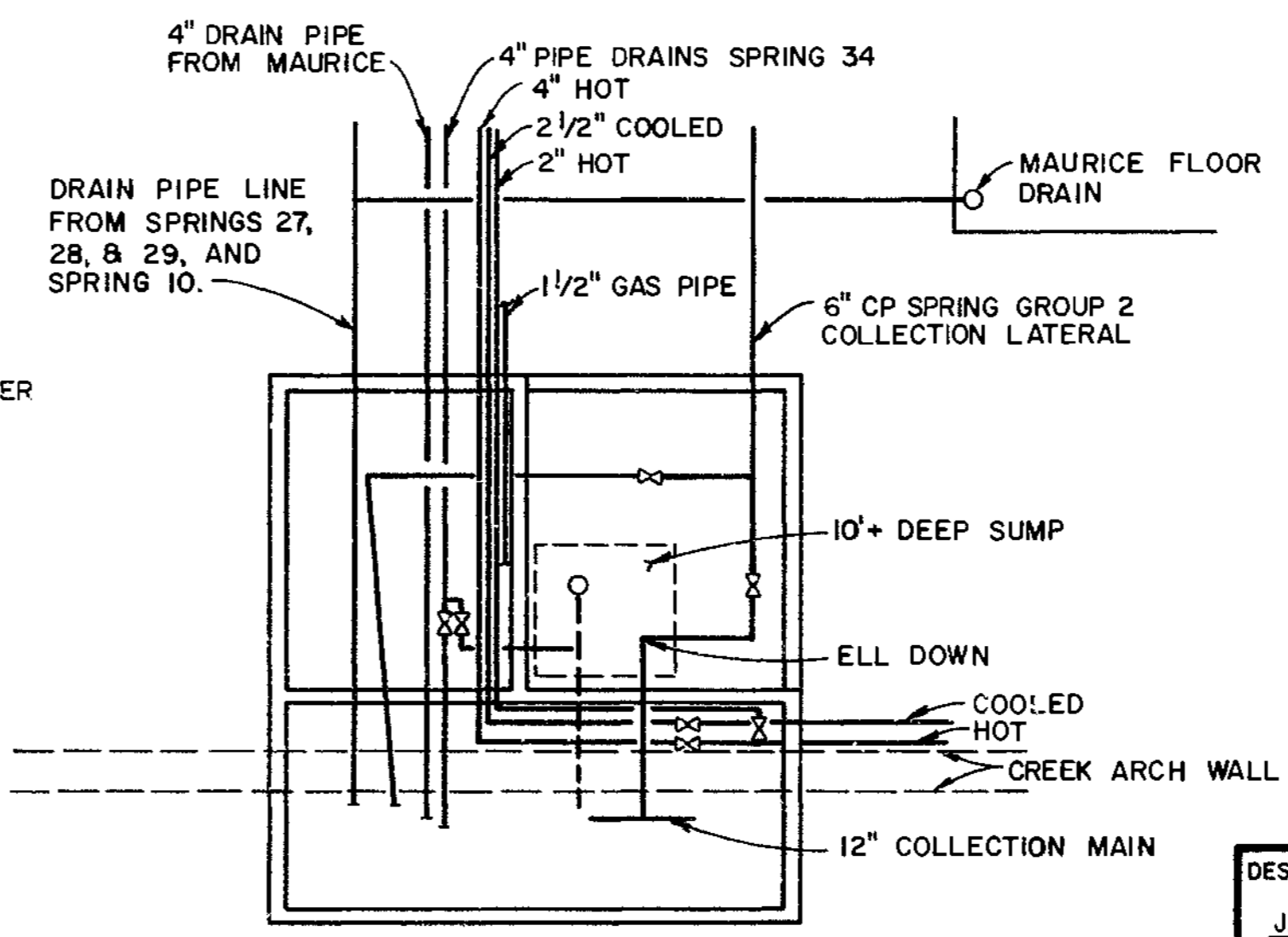
K HIGH LEVEL PUMP CHAMBER
NOT TO SCALE
←



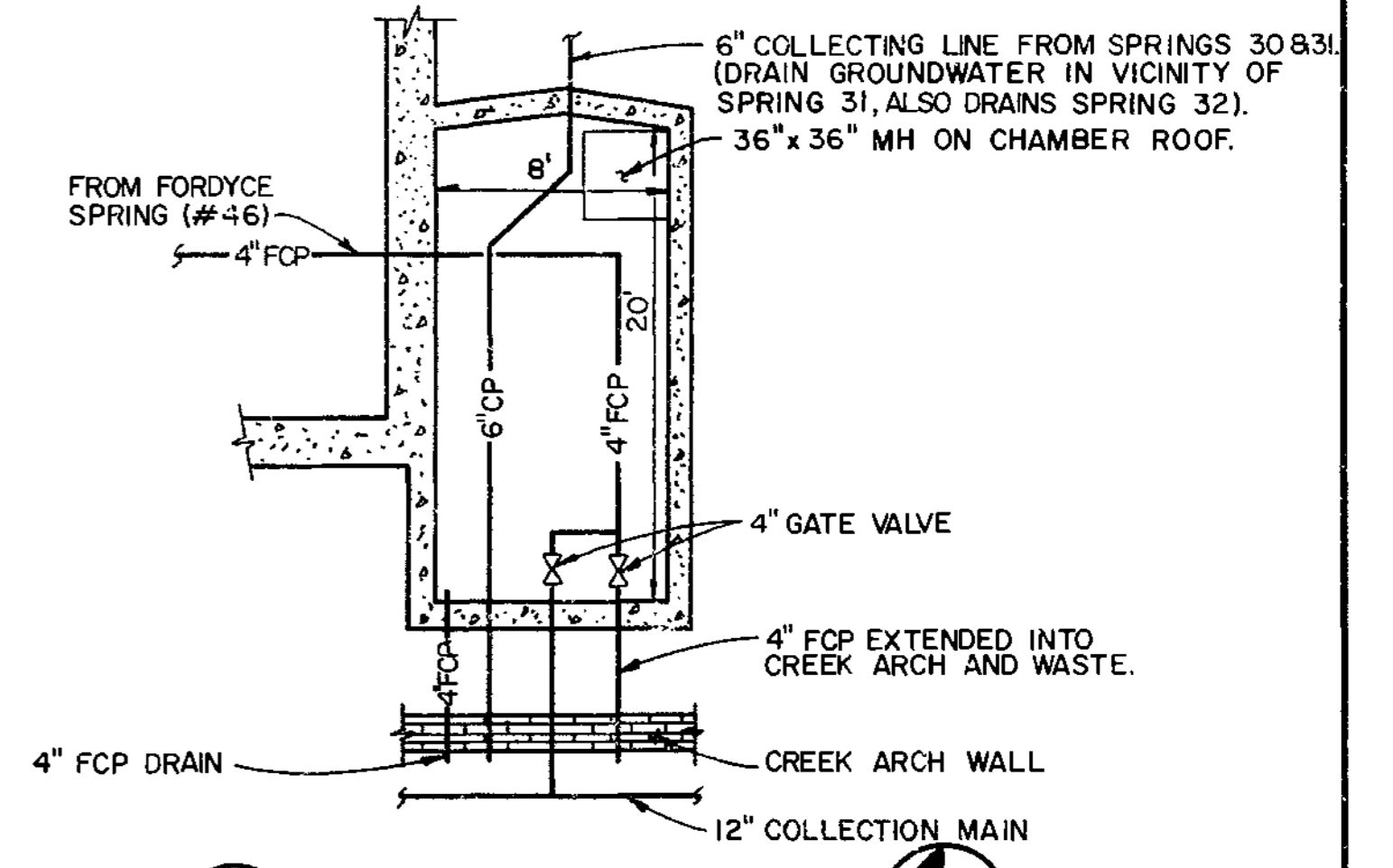
G BATHHOUSE CONNECTION
SCALE: 1"=4'
↑



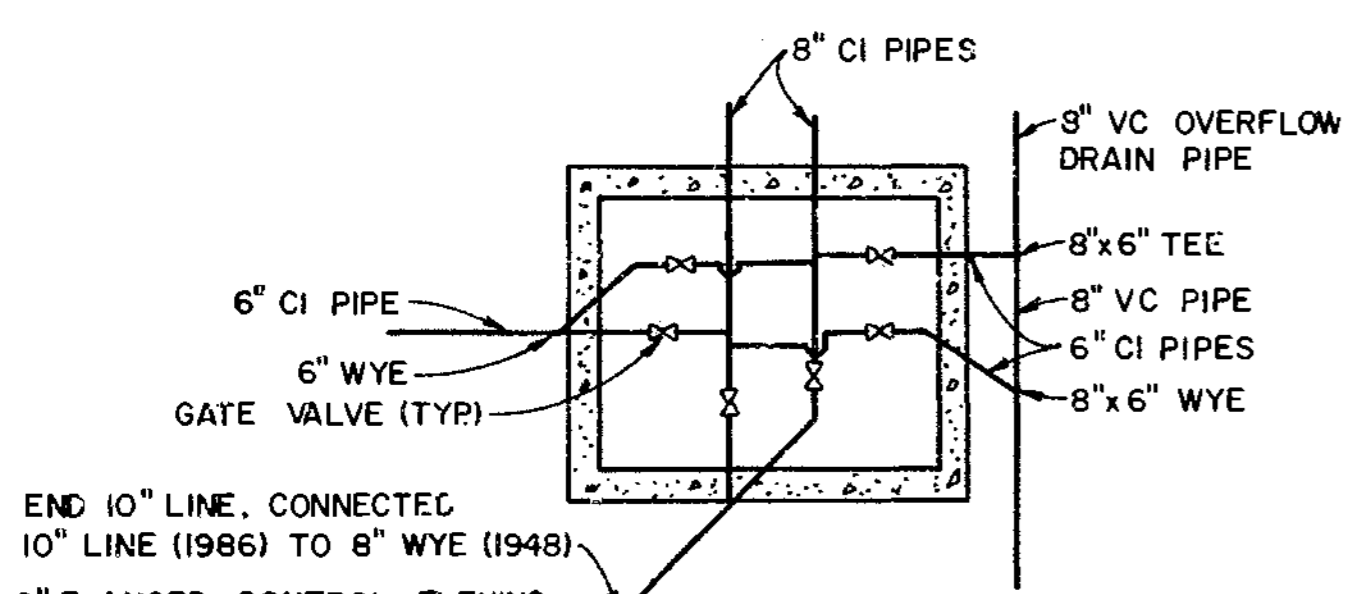
H TRENCH SECTION
NOT TO SCALE



I MAURICE VALVE PIT
NOT TO SCALE
←



J FORDYCE VALVE CHAMBER
NOT TO SCALE
←



D RESERVOIR VALVE BOX
NOT TO SCALE
←

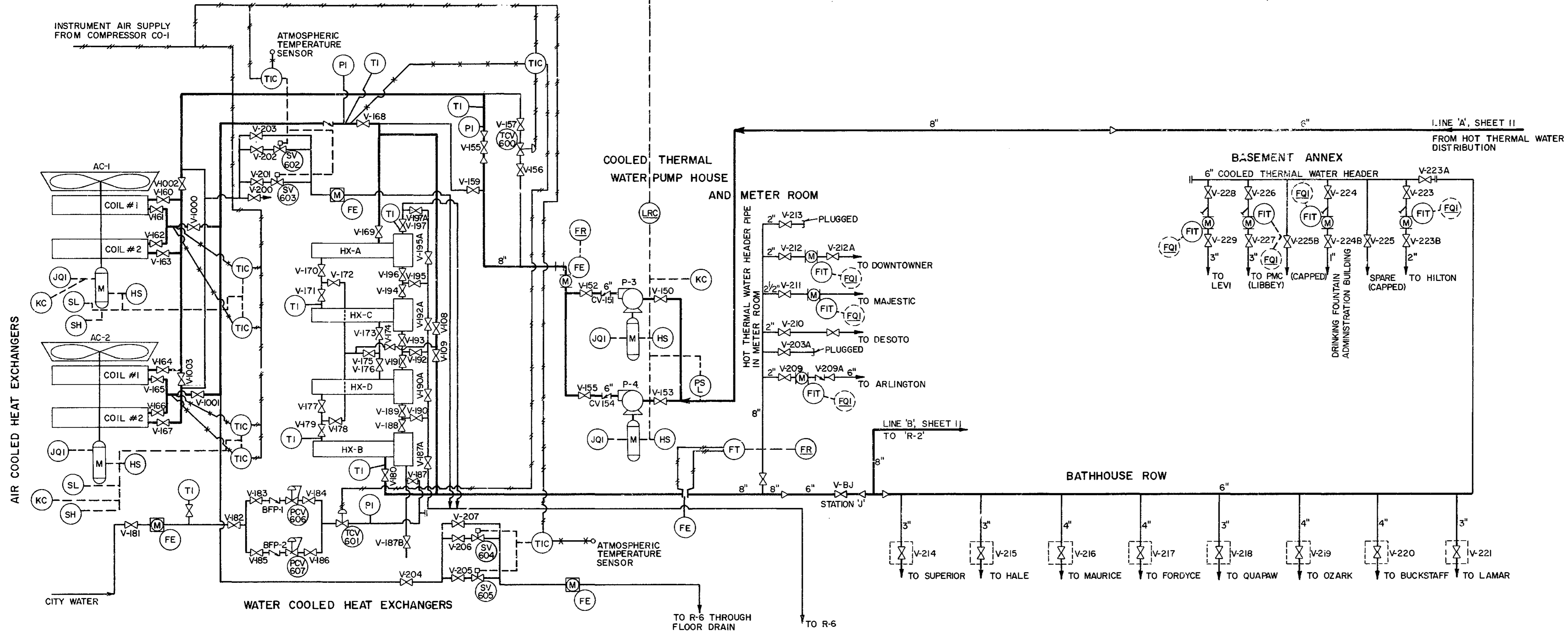
END 10" LINE. CONNECTED 10" LINE (1986) TO 8" WYE (1948)

8" FLANGED, CONTROL FLEXING EXPANSION JOINT WITH LIMITED MOVEMENT. DRESSER STYLE 83 (1986).

NOTE: ALL PIPES ARE HOT WATER

DESIGNED: JACOBS	SUB SHEET NO.	TITLE OF SHEET DETAILS	DRAWING NO. 128 41,035
DRAWN: MJEIMES			PKG. NO.
TECH. REVIEW:			9
DATE: 4/1988			OF 12

FROM LT
R-2



LEGEND

SYMBOL	DESCRIPTION
	COMPRESSED AIR
	CAPILLARY TUBES
	ELECTRICAL SIGNAL
	GATE VALVE
	CHECK VALVE
	REDUCER
	PUMP
	MOTOR
	ELEMENTS AS ABBREVIATED
	PANEL MOUNT
	REMOTE
	LOCAL INDICATING FLOW METER
	TURBINE METER
	CONTROL VALVE
	PRESSURE CONTROL VALVE
	SOLENOID VALVE

ABBREVIATIONS

EQUIPMENT:	INSTRUMENTATION:	TEMPERATURE:	PRESSURE:
AC AIR COOLERS	FE FLOW ELEMENT	TCV TEMPERATURE CONTROL VALVE	PCV PRESSURE CONTROL VALVE
HX HEAT EXCHANGERS	FI FLOW INDICATOR	TI TEMPERATURE INDICATOR	PI PRESSURE INDICATOR
P PUMPS	FIT FLOW INDICATOR TRANSMITTER	TIC TEMPERATURE INDICATOR CONTROLLER	PS PRESSURE SWITCH
R RESERVOIRS	FQI FLOW TOTALIZER INDICATOR		PSH PRESSURE SWITCH HIGH
SP SUMP PUMPS	FR FLOW RECORDER		PSL PRESSURE SWITCH LOW
	FT FLOW TRANSMITTER		

LEVEL:

LIC LEVEL INDICATOR CONTROLLER
LRC LEVEL RECORDER CONTROLLER
LT LEVEL TRANSMITTER

MISC:

BFP BACK FLOW PREVENTOR
CO COMPRESSOR
CV CHECK VALVE
HS HAND SWITCH
JQI CUMMULATIVE WATT METER INDICATOR
KS TIMER
M TURBINE METER
MCV MOTOR CONTROL VALVE
SH SPEED SWITCH HIGH
SL SPEED SWITCH LOW
SV SOLENOID VALVE
ZS LIMIT SWITCH

LIST OF RESERVOIRS

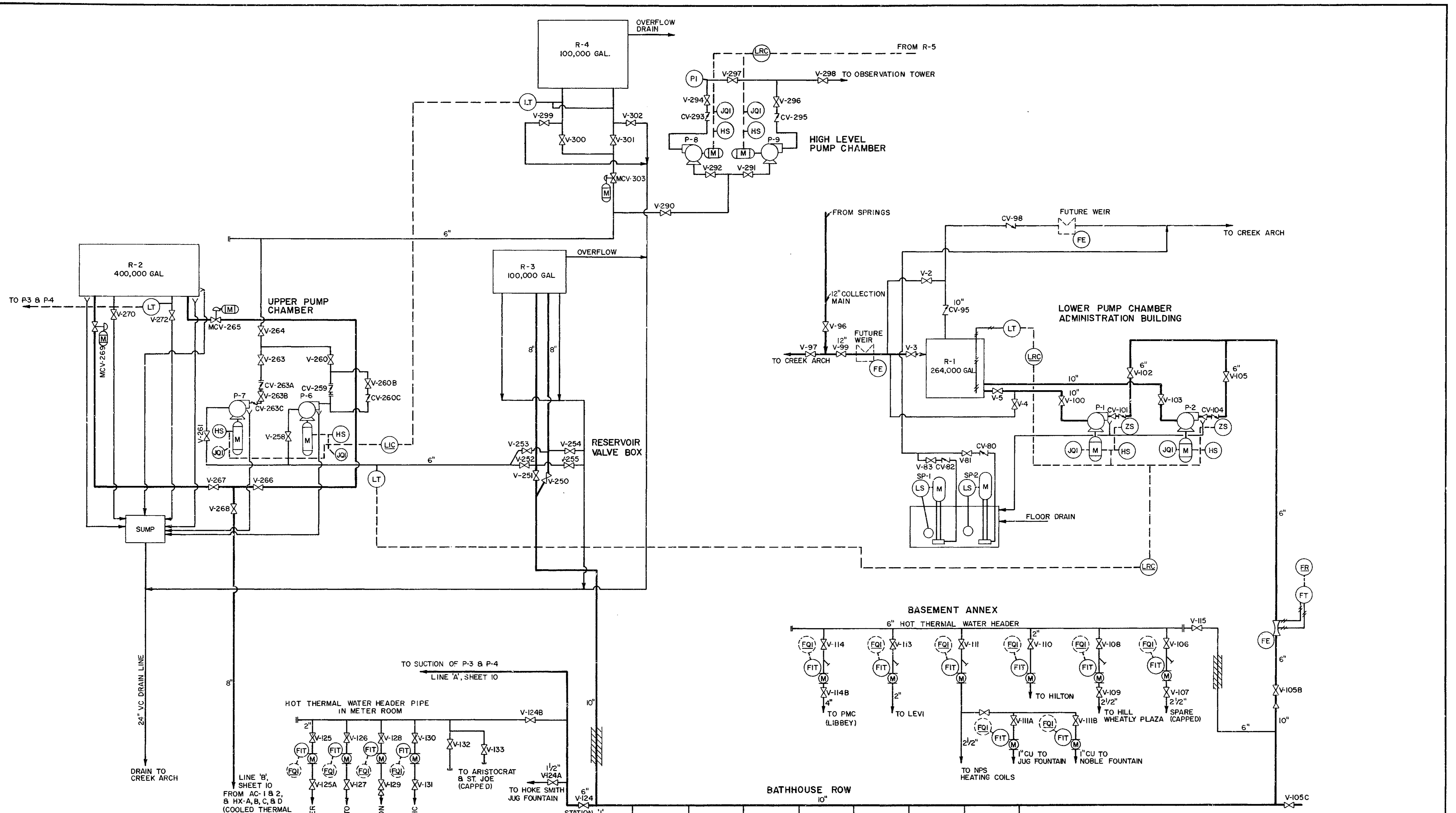
R-1	264,000 GALLON HOT THERMAL WATER BASEMENT ADMINISTRATION BUILDING ELEV. 576±.
R-2	400,000 GALLON COOLED THERMAL WATER HOT SPRINGS MOUNTAIN ELEV. 721±.
R-3	100,000 GALLON HOT THERMAL WATER HOT SPRINGS MOUNTAIN ELEV. 721±.
R-4	100,000 GALLON HOT THERMAL WATER STAGING RESERVOIR, HOT SPRINGS MOUNTAIN ELEV. 812±.
R-5	5,000 GALLON HOT THERMAL WATER AT OBSERVATION TOWER ELEV. 1000±.
R-6	CITY WATER COLLECTION RESERVOIR FOR LAWN WATERING PURPOSES 11,600 GALLONS (APPROX.).

DESIGNED:	FRITZLER
DRAWN:	MJNEIMES
TECH. REVIEW:	
DATE:	4/1988

SUB SHEET NO.	
PKG. NO.	10
SHEET	OF 12

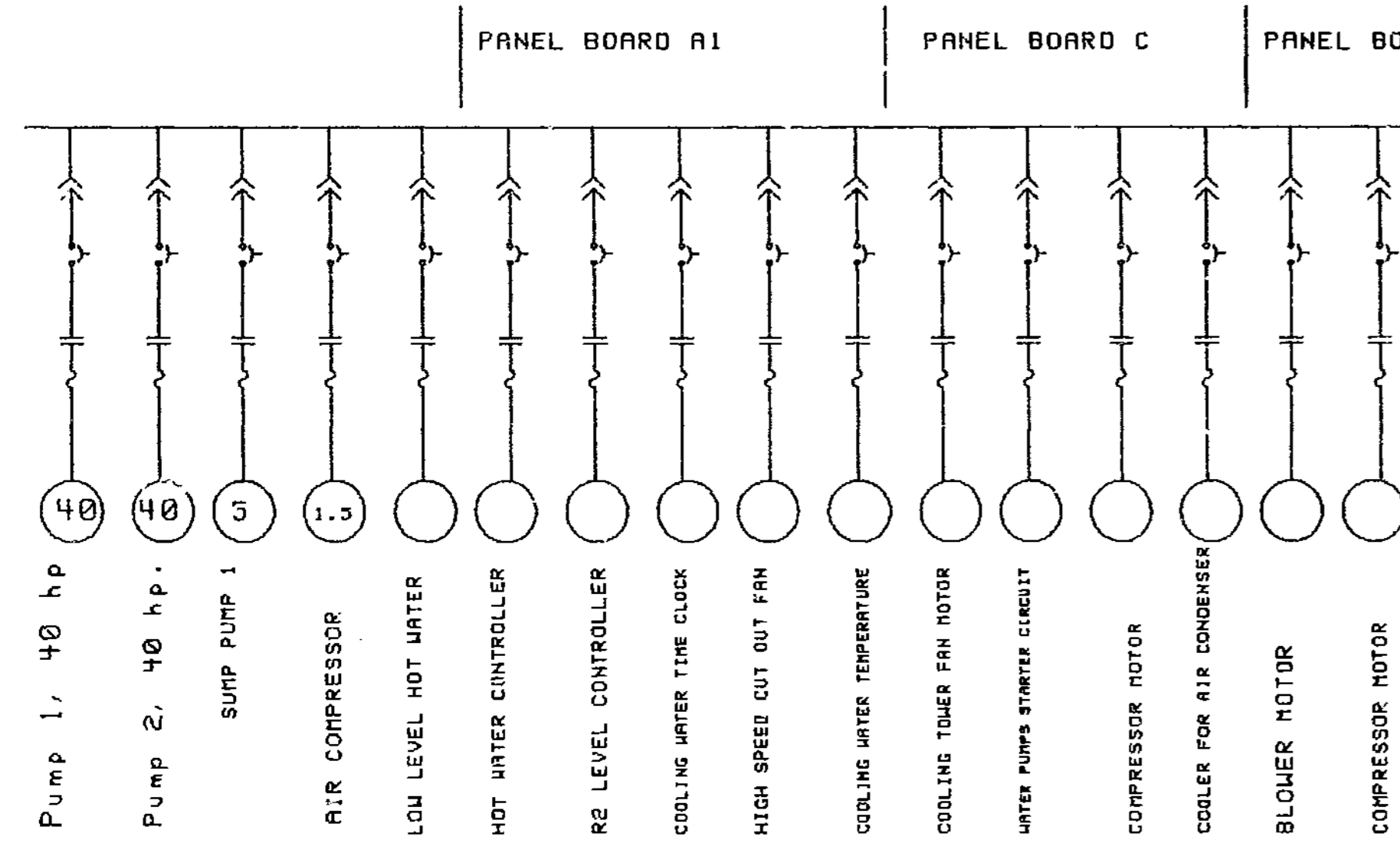
TITLE OF SHEET
PROCESS AND INSTRUMENTATION DIAGRAMS
COOLED WATER DISTRIBUTION SYSTEM

DRAWING NO.	128
	41,035
PKG. NO.	10
SHEET	OF 12



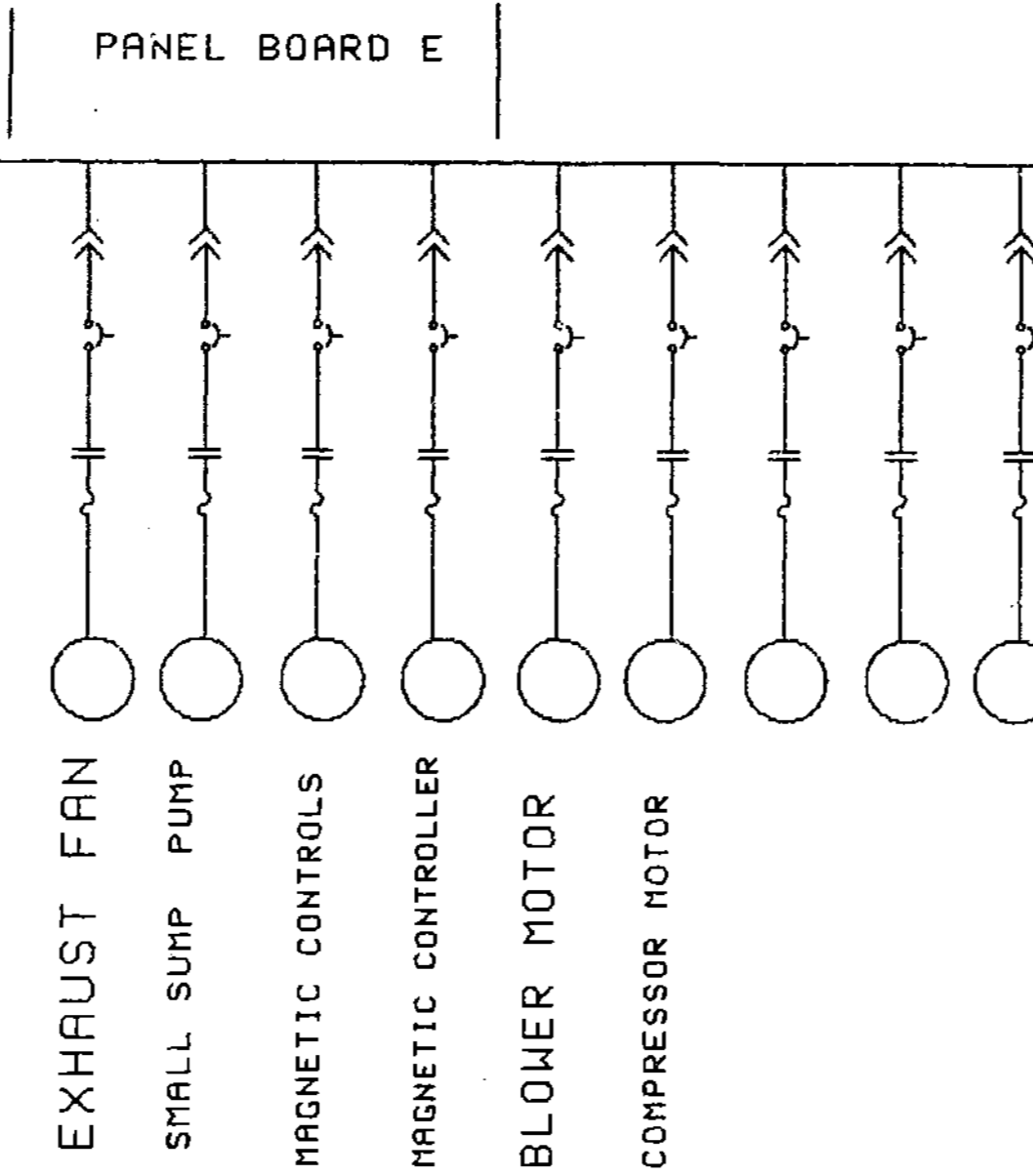
DESIGNED: FRITZLER	SUB SHEET NO.	TITLE OF SHEET PROCESS AND INSTRUMENTATION DIAGRAMS		DRAWING NO. 128
DRAWN: MONEIMES		HOT WATER DISTRIBUTION SYSTEM		4,035
TECH. REVIEW:		PKG. NO.	SHEET NO.	11
DATE: 4/1988		OF		12

MCC MAIN COLLECTION RESERVOIR PUMP CHAMBER



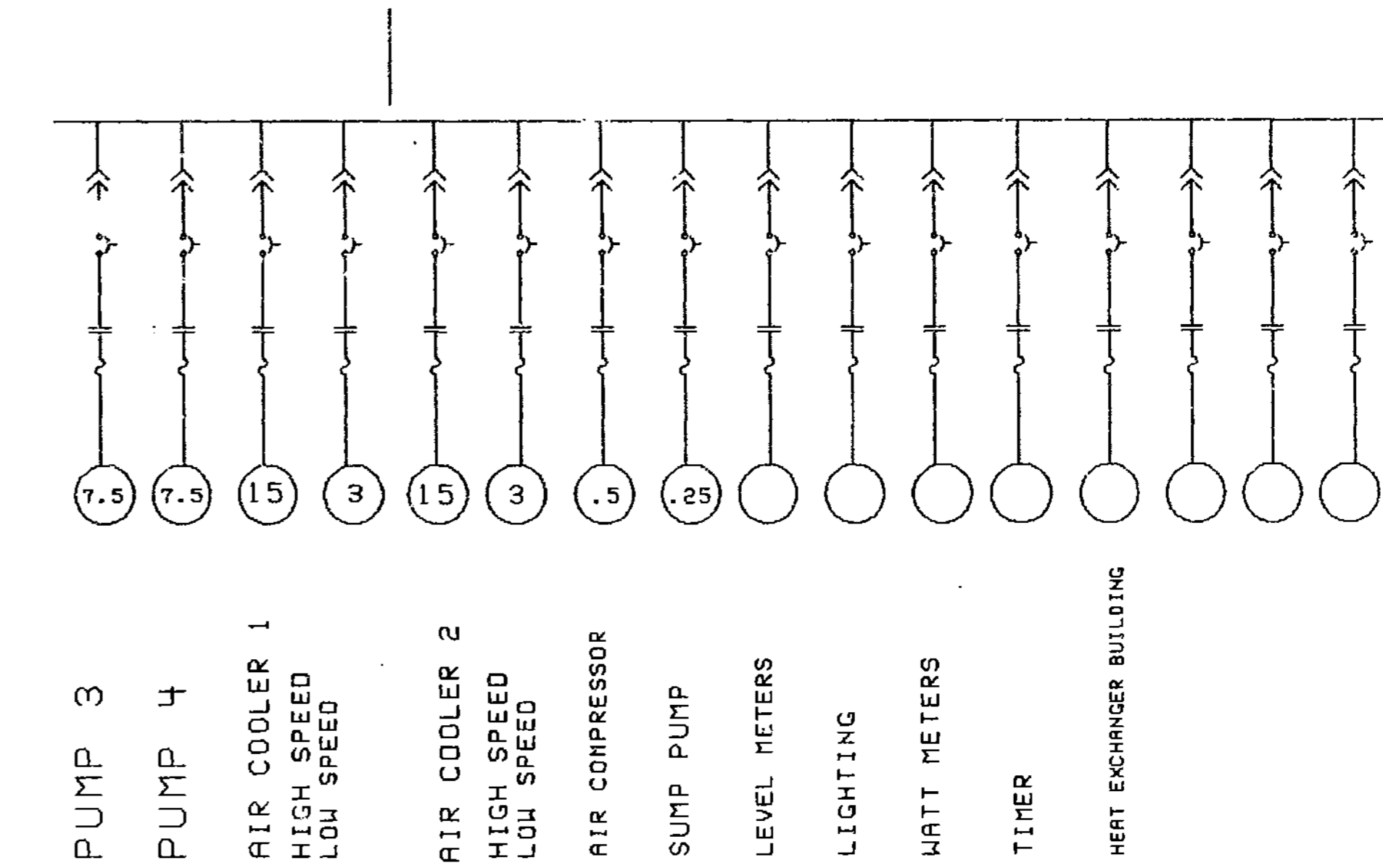
- Pump 1, 40 hp
- Pump 2, 40 hp
- SUMP PUMP 1
- AIR COMPRESSOR
- LOW LEVEL HOT WATER
- HOT WATER CONTROLLER
- RE LEVEL CONTROLLER
- COOLING WATER TIME CLOCK
- HIGH SPEED CUT OUT FAN
- COOLING WATER TEMPERATURE
- COOLING TOWER FAN MOTOR
- WATER PUMPS STARTER CIRCUIT
- COMPRESSOR MOTOR
- COOLER FOR AIR CONDENSER
- BLOWER MOTOR
- COMPRESSOR MOTOR

MCC MAIN COLLECTION RESERVOIR PUMP CHAMBER



- EXHAUST FAN
- SMALL SUMP PUMP
- MAGNETIC CONTROLS
- MAGNETIC CONTROLLER
- BLOWER MOTOR
- COMPRESSOR MOTOR

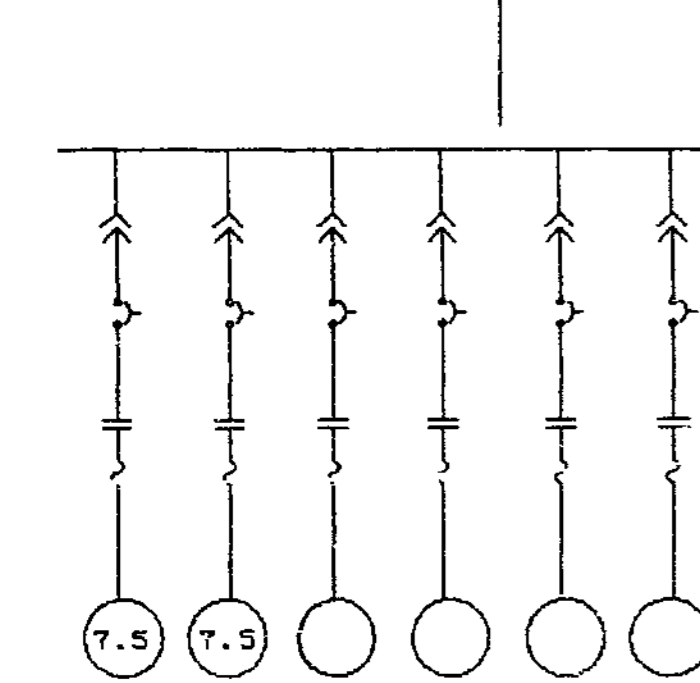
MCC COOLED WATER PUMP CHAMBER



- PUMP 3
- PUMP 4
- AIR COOLER 1
- HIGH SPEED
- LOW SPEED
- AIR COOLER 2
- HIGH SPEED
- LOW SPEED
- AIR COMPRESSOR
- SUMP PUMP
- LEVEL METERS
- LIGHTING
- WATT METERS
- TIMER
- HEAT EXCHANGER BUILDING

REF. DWG.
NPS DRAWING NO.
NP - HS 5311

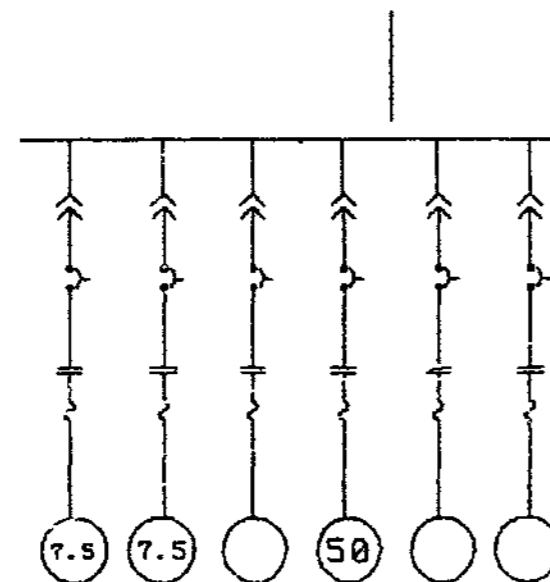
LOW LEVEL PUMP CHAMBER



- PUMP 8
- PUMP 7
- LIGHTING

REF. DWG.
SQUARE D COMPANY
C50126 - 468 - 121715 AE
DATE 2/29/87

UPPER LEVEL PUMP CHAMBER



- PUMP 8
- PUMP 9
- LIGHTING
- HEATER

REF. DWG.
INSTRUMENT SUPPLY
FROM MCC ELEMENTARY DIAGRAM UPPER LEVEL

ONE LINE DIAGRAM

- BUS OF CABLE RUN
- - - - - EXISTING OR FUTURE BUS
- CONTROL OR METERING CIRCUIT
- - - - - INTERLOCK BETWEEN DEVICES CONNECTED
- ⊕ COMBINATION MOTOR STARTER WITH MOTOR CIRCUIT PROTECTOR, NEMA CONTACTOR
- ⊕ POTENTIAL TRANSFORMER, DRODOWN TYPE WITH CURRENT LIMITING FUSES DISTRIBUTION TRANSFORMER
- ⊕ CURRENT TRANSFORMER (INDICATE TURN RATIO AND QUANTITY) DISTRIBUTION TRANSFORMER
- ⊕ TRANSFORMER CONNECTIONS-DELTA PRIMARY, GROUNDED WYE SECONDARY
- ⊕ TRANSFORMER-SECONDARY WYE RESISTANCE GROUNDED (GIVE AMPERE RATING IN SECONDS)
- ⊕ MOULDED CASE CIRCUIT BREAKER, 600V, MANUALLY OPERATED, 3 OVERLOAD ELEMENTS (GIVE FRAME AND TRIP RATING)
- ⊕ POWER AIR CIRCUIT BREAKER, 600V DRODOWN TYPE, MANUALLY OPERATED, STORED ENERGY MECHANISM (ELECTRICALLY OPERATED IF MARKED "E - OP")
- ⊕ POWER CIRCUIT BREAKER, 5KV OR 15KV (AS NOTED)
- ⊕ FUSED DISCONNECT SWITCH (TYPE AND RATING AS SPECIFIED)
- ⊕ FUSED CUTOUT
- ⊕ KEY INTERLOCK
- ⊕ CAPACITOR
- ⊕ INDUCTION MOTOR
- ⊕ WOUND ROTOR MOTOR
- ⊕ SYNCHRONOUS MOTOR
- ⊕ MOTOR GENERATOR

- ⊕ MOTOR WITH CLUTCH
- ⊕ GROUND
- ⊕ CONTROL OR TRANSFER SWITCH
 - AS - AMMETER SWITCH
 - VS - VOLTMETER SWITCH
 - CS - CONTROL STATION
 - TS - TEST SWITCH
 - BS - BYPASS SWITCH
- ⊕ INDICATING METER
 - A - AMMETER
 - V - VOLTMETER
 - W - WATTMETER
 - PF - POWER FACTOR METER
 - WHH - WATTHOUR METER
 - KWH - KILOWATT HOUR METER
 - WHD - WATTHOUR METER WITH DEMAND REGISTER
 - VAR - VARIMETER

DESIGNED: FRITZLER	SUB SHEET NO.	TITLE OF SHEET ONE LINE - ELECTRICAL		DRAWING NO. 128
DRAWN: MJNEIMES				41,035
TECH. REVIEW:				PKG. NO. SHEET
DATE: 4/1988				12
				OF 12

Chlorinating Waterlines or Wells

<i>Pipe Section or Well Information</i>	<i>Pipe or Tank Dia. (in)</i>	<i>Pipe Length or Tank Height (ft)</i>	<i>Area (in²)</i>	<i>Gallons in Tub</i>	<i>Disinfectant Chlorine Sol % decimal</i>	<i>Desired Chlorine Residual (mg/L)</i>	<i>Gallons of Chlorine needed</i>	<i>Ounces of Chlorine Solution</i>	<i>Table Spoons</i>
Tub Scenario A	2	800	3.14	130.551	10.00%	1.5	0.002	0.25	0.50
Tub Scenario B	2	900	3.14	146.9	10.00%	1.5	0.002	0.28	0.56
Tub Scenario C	6	700	28.27	1028.1	10.00%	1.5	0.015	1.97	3.94
Tub Scenario D	2	650	3.14	106.1	10.00%	1.5	0.002	0.20	0.41
Tub Scenario E	2	613	3.14	100.0	10.00%	1.5	0.001	0.19	0.38

Notes: Changing the numbers in red will modify the amount of chlorine needed in gallons and ounces. If a well is disinfected, type in the diameter and

Caution: Highly chlorinated well water can damage grass and plants (under no circumstances should the water be discharged to the environment). Do not

If you have questions, please contact your local public health consultant or 402-661-1718 or the NPS OPH water committee chair

Basics for Small Water Systems in Oregon: Storage Tank Chlorination

Disinfection concentrations and times are based on AWWA Standard C652 for storage tanks cited in: OAR 333-061-0050 "Construction Standards" (10)(d) dated 19 Apr 2010, page 297

Question: How much chlorine is added to a tank?

Volume to be disinfected = 500 gallons

(input tank volume above in yellow shaded cell)

Chlorination Dose for Storage Tank of Volume Specified Above	Method A ^b	Method B ^c	Units
Chlorine Concentration	10	50	mg/L
Method Exposure Time	6 ^a or 24	6	hours
Chlorine Source Material...			
Bleach 5% Solution	0.10	0.50	gallons ^d
Bleach 12.5% Solution	0.04	0.20	gallons
Dry Chlorine (65% by wt)	0.06	0.32	pounds

Options for Disinfection by Chlorination:

Method A. Filling the tank or reservoir with a **10 mg/L** chlorine solution and allowing it to remain for **6^a** or **24 hours** (see Table).

Method B. Filling the reservoir with a **50 mg/L** chlorine solution and allowing it to stand for **6 hours** (see Table).

Method C. Spraying or brushing on a **200 mg/L** chlorine solution and allowing it to remain for **3 hours** (calculation not provided).

(Chlorine Concentration values [yellow, or grey, cells] can be changed for custom calculations)

Note that to achieve Method concentration **add more** chlorine than specified here.

Important: The chlorine concentration should be measured to confirm Method's target concentration is reached. May need to dilute sample to test kit range.

^a Six (6) hours for addition by continuous feed during tank filling.

^b For **Pipes**, Method A using **24 hours** is applicable (shorter time at higher dose may be allowed, see Guidance).

^c For **Wells**, Method B using **24 hours** is applicable (shorter time at higher dose may be allowed, see Guidance).

^d Gallons to Cups conversion:
(gal x 16 = cups)

Gallons	Cups
1.6	25.6

Weight of dry chlorine with a lower percentage than 65% can be calculated by dividing 65% by the product's % chlorine (e.g., 65%/47%) times result in table.

DATA FOR SLOPE CALCULATIONS

(Data from FACT SHEET 3.7 in UNIT 3 - Operations of Staff Training Reference)

Reservoir (Gal)	Gallons 5% Bleach	Reservoir (Gal)	Pounds 65% Dry Chlorine
1000	0.5	10000	3.5
2000	1.0	20000	6.5
3000	1.5	30000	10
4000	2.0	40000	13
5000	2.5	50000	16
10000	5.0	100000	32
20000	10	200000	64
30000	15	300000	100
40000	20	400000	130
50000	25	500000	160

Slope 5% St 0.0005 gal/gal Slope Dry Wt = 0.000323071 lb/gal

Conversion factors
 2.204623 lb/kg
 3.785412 L/gal

Reference C 0.000025 mg/L 2.51631E-05 mg/L
 25 mg/L reference concentration (from tables in training manual)

Number	Starting Location	Notes	Additional notes?
1	Cooled Thermal Reservoir Right Side Bottom	from 6" drain flush - 1 minute fully open	
2	Cooled Thermal Reservoir Right Side Bottom	from 6" drain flush - 1 minute fully open	
3	Cooled Thermal Reservoir Left Side Top	Approximately 8" from the top of the water	
4	Cooled Thermal Reservoir Right Side Top	Approximately 8" from the top of the water	
5	Thermal Vector Main Collector at Admin	from overflow weir	
6	Area in Cooling Reservoir	One sample from access of between buildings - 18" from surface	
7	Admin Cooling Reservoir	One sample from access of between buildings - 18" from surface	
8	Hot Thermal 100K Reservoir	from 6" drain flush - 1 minute fully open	
9	Hot Thermal 100K Reservoir	Approximately 8" from the top of the water	
10	Jug Fountain from Admin (only has hot)	Sample closest to the constant overflow line, reach min 135F and maintain for a min of 5 minutes	
11	Jug Fountain from Utility Area (only has hot)	Sample closest to the constant overflow line, reach min 135F and maintain for a min of 5 minutes	
12	Jug Fountain Phlebotomy across the road from Admin (only has hot)	Sample closest to the constant overflow line, reach min 135F and maintain for a min of 5 minutes	
13	Robot Fountain only has hot	Sample closest to the constant overflow line, reach min 135F and maintain for a min of 5 minutes	
14	Airflow cooled thermal	from valve box outside building or before RPE if inside the building, flush - 100 gallons if needed	
15	Airflow hot thermal	from valve box outside building or before RPE if inside the building, reach min 130F and maintain for a min of 5 minutes	
16	Duckweed Cooled Thermal	from valve box outside building or before RPE if inside the building, flush - 100 gallons if needed	
17	Racktop Hot Thermal	from valve box outside building or before RPE if inside the building, reach min 135F and maintain for a min of 5 minutes	
18	Low Cooled thermal	from valve box outside building or before RPE if inside the building, flush - 2,000 gallons if needed	
19	Low Hot Thermal	from valve box outside building or before RPE if inside the building, reach min 135F and maintain for a min of 5 minutes	
20	Quarzo Cooled thermal	from valve box outside building or before RPE if inside the building, flush - 100 gallons if needed	
21	Quarzo Hot thermal	from valve box outside building or before RPE if inside the building, reach min 135F and maintain for a min of 5 minutes	
22	Superior Hot thermal	from valve box outside building or before RPE if inside the building, reach min 135F and maintain for a min of 5 minutes	
23	Any additional jug - public access to drinking thermal water? (H2O?)	Sample closest to the constant overflow line, reach min 135F and maintain for a min of 5 minutes	There should be no access to cool thermal water for public access to drink
24	Hot Cooled thermal	from valve box outside building or before RPE if inside the building, flush - 100 gallons if needed	Flush and see this takes heating and sampling location
25	Hot Hot thermal	from valve box outside building or before RPE if inside the building, reach min 130F and maintain for a min of 5 minutes	
26	Hot Hot Thermal furthest room to left on parking upstairs	from valve box outside building or before RPE if inside the building, reach min 135F and maintain for a min of 5 minutes	
27	Hot Cooled Thermal furthest room to left on parking upstairs	from valve box outside building or before RPE if inside the building, flush - 100 gallons if needed	
28	Hot Hot Thermal furthest room to the right on parking upstairs	from valve box outside building or before RPE if inside the building, reach min 130F and maintain for a min of 5 minutes	
29	Hot Cooled Thermal furthest room to the right on parking upstairs	from valve box outside building or before RPE if inside the building, flush - 100 gallons if needed	
30	Hot Hot Thermal furthest room to the right on parking main level	from valve box outside building or before RPE if inside the building, reach min 130F and maintain for a min of 5 minutes	
31	Hot Cooled Thermal furthest room to the right on parking main level	from valve box outside building or before RPE if inside the building, flush - 100 gallons if needed	
32	At Cooling Water Valve Chamber 6" line to Airflow H2O?	tap line and flush for - 1 minute in sample if possible	
33	At Cooling Water Valve Chamber 2" line to H2O?	tap line and flush for - 1 minute to sample if possible	
34	At Cooling Water Valve Chamber 2" line to H2O?	tap line and flush for - 1 minute to sample if possible	
35	Admin Basement Hot Water Header to coils on all 12 drinking	As close to the end of the header as possible. Flush to reach min 135F and maintain for a min of 5 minutes	Please note what buildings this serves and any dead end lines on it. All valves closed to unused fixtures?
36	Admin Basement Hot Water Header to coils on all 12 drinking	As close to the end of the header as possible. Flush to reach min 135F and maintain for a min of 5 minutes	
37	Cooled Reservoir Cold Water Header to coils on all 12 drinking	As close to the end of the header as possible. Flush to reach min 135F and maintain for a min of 5 minutes	
38	Cooled Reservoir Hot Water Header to coils on all 12 drinking	As close to the end of the header as possible. Flush to reach min 135F and maintain for a min of 5 minutes	
39	Any other lines key on the cooled and hot thermal water systems?	flush lines as needed to get a representation of the water	
40			
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Susceptibility of *Legionella pneumophila* to Chlorine in Tap Water

JOHN M. KUCHTA,¹* STANLEY J. STATES,¹ ANN M. McNAMARA,² ROBERT M. WADOWSKY,²
AND ROBERT B. YEE²

Department of Water, Pittsburgh, Pennsylvania 15215,¹ and Department of Infectious Diseases and Microbiology, Graduate School of Public Health, University of Pittsburgh, Pittsburgh, Pennsylvania 15261²

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A study was conducted to compare the susceptibility of legionellae and coliforms to disinfection by chlorine. The chlorine residuals used were similar to concentrations that might be found in the distribution systems of large public potable water supplies. The effects of various chlorine concentrations, temperatures, and pH levels were considered. A number of different *Legionella* strains, both environmental and clinical, were tested. The results indicate that legionellae are much more resistant to chlorine than are coliform bacteria. At 21°C, pH 7.6, and 0.1 mg of free chlorine residual per liter, a 99% kill of *L. pneumophila* was achieved within 40 min, compared with less than 1 min for *Escherichia coli*. The observed resistance is enhanced as conditions for disinfection become less optimal. The required contact time for the removal of *L. pneumophila* was twice as long at 4°C than it was at 21°C. These data suggest that legionellae can survive low levels of chlorine for relatively long periods of time.

During the past several years, *Legionella pneumophila* has been isolated from shower heads, taps, mixing valves, and hot water tanks of hospitals, hotels, and homes (7, 8, 25-27, 29). In a number of cases, the occurrence of legionellae in the plumbing systems was associated with disease; in other cases, it was not.

These bacteria have been found primarily in hot water systems. In particular, large numbers of legionellae have been detected in the sediment that accumulates at the bottom of institutional hot water tanks. Typically, the temperature at the bottom of the tanks, especially in hospital tanks intentionally maintained at relatively low temperatures (e.g., 43 to 55°C), falls within the optimal range for the growth of these organisms (19, 29). It has been shown experimentally that *L. pneumophila* grows in unsterilized tap water within the range of the temperatures found at the bottom of institutional tanks (31). This observation led to the hypothesis that hot water tanks act as breeding sites for the contamination of plumbing systems (29).

A question arises concerning the initial introduction of *L. pneumophila* into the hot water tanks. It has been suggested that plumbing systems may be seeded by small numbers of legionellae from public water supply reservoirs (25, 29). However, attempts to actually isolate these bacteria from the mains of water supplies have not been successful (12). Such evidence would

be difficult to obtain since the legionellae may occur sporadically and in low numbers.

Legionellae in a public water supply would be exposed to chlorine concentrations that had been adjusted to control the presence of the indicator coliform bacteria. A number of studies have been conducted to determine the bactericidal effectiveness of a variety of disinfectants against *L. pneumophila* (11, 13, 15). Most of this work has been directed toward problem areas such as cooling towers and evaporative condensers of air conditioning systems. Skaliy et al. (24) found that free chlorine at concentrations of 3.3 and 6.6 mg/liter rapidly inactivated *L. pneumophila*. These relatively high chlorine concentrations were typical of those utilized in cooling towers. Wang et al. (30) examined the effectiveness of disinfectants at concentrations normally used in hospitals for the decontamination of tissues and surfaces. The investigation included the effect of relatively high concentrations of hypochlorite on both *L. pneumophila* and *Escherichia coli*. Their data suggested that legionellae might be somewhat more resistant to these high chlorine concentrations than are the coliform bacteria. They also raised the suspicion that the amount of residual chlorine recommended for standard water purification might not be sufficient for killing *L. pneumophila* when the bacteria are present in high numbers.

Our study pursued the question of *Legionella*

susceptibility to chlorine by examining the bactericidal effectiveness of chlorine at levels which might be found in public water distribution systems. A number of *Legionella* strains from several sources, both environmental and clinical, were examined for susceptibility to chlorine. A comparison was made with *E. coli*, *Klebsiella pneumoniae*, and *Enterobacter aerogenes* since these bacteria are members of the coliform group which is the commonly accepted microbial indicator for disinfection. Consideration was also given to measuring changes in susceptibility of *L. pneumophila* to variations in chlorine concentration, temperature, and pH level that might be found in different water systems.

MATERIALS AND METHODS

Bacteria. A number of bacterial strains from various sources were used in this study (Table 1). Several environmental strains of *L. pneumophila* were isolated from samples collected from the Allegheny River in Pittsburgh, Pa. This river is the source of water for the municipal water supply system. To obtain these isolates, 20 liters of river water were concentrated to 10 ml by centrifugation on a Sorvall model RC-2B centrifuge that was equipped with a continuous-flow attachment. Due to the biological complexity of the river water, acid and heat enrichment procedures were used to exclude competing microorganisms. The concentrate was heated for 30 min at 50°C and then treated with 2 parts of a 0.2 M HCl-0.2 M KCl buffer solution (pH 2.2) (3, 31). The sample was then plated on a selective medium, differential glycine-vancomycin-polymyxin B agar (28). *L. pneumophila* was identified on the basis of colonial morphology, the inability to grow on unsupplemented buffered charcoal-yeast extract agar, and the direct immunofluorescence test (6, 28). The environmental isolates used in this study had been subcultured three times on artificial medium before this experiment.

Environmental strains of *L. pneumophila* serogroups 1 and 6 and *Legionella micdadei* were also isolated from water and sediment which had been collected from the bottom of hospital hot water tanks by direct plating of the samples on differential glycine-vancomycin-polymyxin B agar.

The Centers for Disease Control-derived strain of *L. pneumophila* (Philadelphia 1), the clinical isolate of *L. micdadei* (EK), and the American Type Culture Collection-derived strains of *E. coli* (ATCC 25922) and *Staphylococcus aureus* (ATCC 25923) were kindly supplied by A. W. Pasculle of the Presbyterian-University Hospital, Pittsburgh, Pa.

Experimental procedure. The bactericidal effectiveness of chlorine was examined by inoculating tap water with known quantities of legionellae and treating these aquatic test systems with chlorine. The action of chlorine was stopped by the addition of 0.1 ml of a 10% (wt/vol) solution of sodium thiosulfate to a 10-ml sample. Viable counts of legionellae were obtained by plating both 0.1 and 0.5 ml of a test system on buffered charcoal-yeast extract agar (21). Colony counts were performed after incubation of the plates at 37°C for 7 days. Appropriate chlorine, bacteria, and thiosulfate controls were included in each experiment. The inhibi-

TABLE 1. Bacteria tested for chlorine resistance

Bacteria	Origin (strain) ^a
<i>L. pneumophila</i>	
Serogroup 1	Allegheny River
Serogroup 1	CDC (Philadelphia 1)
Serogroup 1	Hospital hot water tank
Serogroup 6	Hospital hot water tank
<i>L. micdadei</i>	Hospital hot water tank Clinical specimen (EK)
<i>E. coli</i>	ATCC (ATCC 25922) Allegheny River
<i>S. aureus</i>	ATCC (ATCC 25923)
<i>K. pneumoniae</i>	Allegheny River
<i>E. aerogenes</i>	Clinical specimen

^a CDC, Centers for Disease Control; ATCC, American Type Culture Collection.

tion of *L. pneumophila* and the other bacteria by sodium thiosulfate was tested by the addition of the thiosulfate solution to test systems in the presence and absence of chlorine. The exposure of the bacteria in these test systems to the thiosulfate for up to 2 h did not affect their viability compared with control samples which did not contain sodium thiosulfate.

The basic experiments involved a comparison of an environmental isolate of *L. pneumophila* serogroup 1 from the Allegheny River with an American Type Culture Collection-derived strain of *E. coli*. Both bacteria were exposed to identical chlorine concentrations under the same environmental conditions. A free chlorine residual of 0.1 mg/liter was used as the "standard" chlorine concentration. The standard environmental conditions for the basic experiments consisted of pH 7.6 at 21°C. After the addition of chlorine, the sample was rapidly stirred for 30 s at 200 rpm with a Teflon-coated magnetic stirring bar and then slowly stirred (60 rpm) for the remainder of the experiment. The above chlorine concentration and environmental conditions were chosen to simulate conditions that might be found in the distribution of a large public water supply.

In addition to performing experiments under standard conditions, the comparison between *L. pneumophila* and *E. coli* was extended to other chlorine residuals and environmental conditions. In studying the effects of different chlorine concentrations, the same experiment was repeated under standard conditions of pH and temperature but at free chlorine residuals of 0.2 and 0.5 mg/liter. Temperature variations, 4 and 32°C, were tested with a standard chlorine residual of 0.1 mg/liter and pH 7.6. Similarly, the effect of pH 6.0, 7.0, and 7.6 was determined under standard conditions of 0.1 mg of total chlorine per liter at 21°C.

Test system and chlorine determination. The aquatic test system consisted of sterile 1-liter Erlenmeyer flasks containing 600 ml of tap water. The water was obtained from a tap in the municipal water distribution system. Tap water was used because the purpose of

TABLE 2. Comparison of chlorine demand of boiled tap water with demand of deionized, distilled water^a

Boiled tap water		Deionized distilled water	
Total chlorine ^b	Free chlorine ^b	Total chlorine ^b	Free chlorine ^b
0.05	0.05	0.05	0.05
0.10	0.10	0.10	0.10
0.25	0.25	0.25	0.20
0.35	0.35	0.35	0.30
0.50	0.50	0.50	0.45
0.60	0.60	0.60	0.55

^a Essentially chlorine demand-free.

^b Milligrams per liter as determined by the amperometric method.

this study was to investigate the survival of legionellae in a municipal water system. Dechlorination of the tap water was accomplished by boiling it before use. The water was then buffered with a phosphate buffer. KH_2PO_4 (0.5 M) and K_2HPO_4 (0.5 M) were mixed and diluted to a final pH of 6.0, 7.0, or 7.6 (standard) and a final concentration of 10 mM. A 100-mg/liter stock chlorine solution was prepared by dissolving calcium hypochlorite in sterile, distilled, deionized water. A Milli-Q system (Millipore Corp., Bedford, Mass.) was used to deionize the water. Chlorination of the test system was achieved by adding precalculated volumes of this stock to the buffered tap water. Free and total chlorine concentrations were measured at the beginning and end of each experiment by the amperometric method (2) to ensure that no unexpected chlorine demand had appeared in the test system water. Free and total chlorine measurements were also performed at the end of each experiment to determine the degree of chlorine depletion. Chlorine loss never exceeded 10% during any of the experiments.

Initially, the chlorine demand of boiled tap water was compared with that of essentially demand-free, distilled, deionized water. Various amounts of hypochlorite were added to portions of each type of water, and the total and free chlorine concentrations were measured. Boiled tap water was found to be essentially demand-free (Table 2).

To prepare inocula for the test system, *Legionella* and non-*Legionella* bacteria were cultured on buffered charcoal-yeast extract agar at 37°C. *Legionellae* were incubated for 76 h, and the non-*Legionella* bacteria were incubated for 24 h. The bacteria were scraped from the plate, washed twice with 30 ml of distilled water, and then suspended in 5 ml of distilled water. This inoculum was added to the aquatic test system to achieve a bacterial density of ca. 3,000 CFU/ml. This density of *L. pneumophila* is within the range reported in contaminated hot water tanks (29).

RESULTS

The effect of chlorine on *L. pneumophila* at various concentrations of chlorine, contact times, pH levels, and temperatures is summarized in Fig. 1 to 3. The results are expressed in terms of percent survival at progressively longer

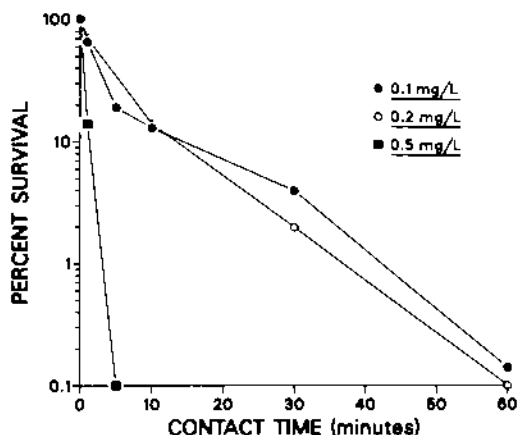


FIG. 1. Bactericidal effect of different concentrations of chlorine on *L. pneumophila* in tap water at pH 7.6 and 21°C.

times of exposure under each of the sets of conditions. *E. coli* was not detected in the samples within min 1 of treatment with chlorine. Identical results were obtained with *S. aureus* as well as with a strain of *K. pneumoniae* that had been isolated from a sample of river water. A river water sample containing a natural population of coliforms was also tested. These coliform bacteria were likewise killed within min 1 of treatment. Because the earliest sampling period after the addition of chlorine was 1 min, bacteria other than *L. pneumophila* are not represented in the figures.

Under the standard conditions of pH 7.6, a temperature of 21°C, and a free chlorine residual of 0.1 mg/liter, a 99% kill of the legionellae did not occur until a contact time of between 30 and

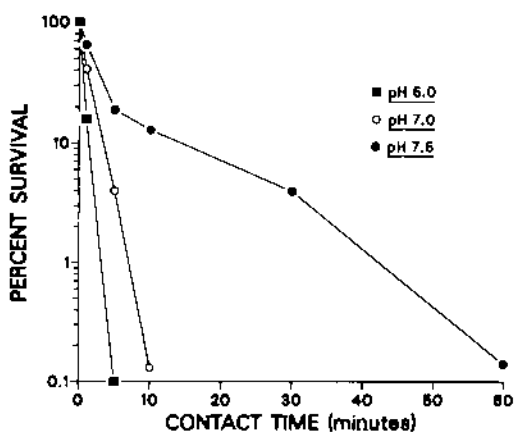


FIG. 2. Effect of pH on bactericidal activity of 0.1 mg of chlorine per liter on *L. pneumophila* in tap water at 21°C.

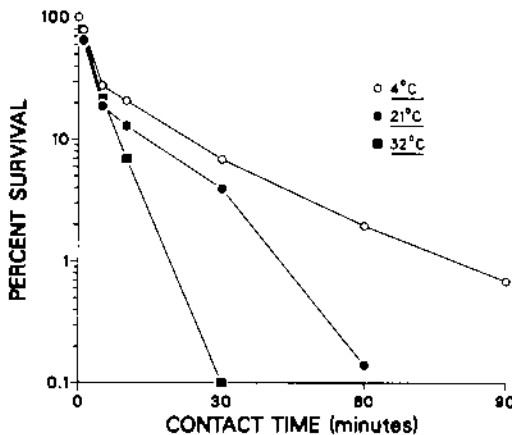


FIG. 3. Effect of temperature on bactericidal activity of 0.1 mg of chlorine per liter on *L. pneumophila* in tap water at pH 7.6.

60 min had elapsed. In addition to the standard bacterial concentration of 3,000 CFU/ml, a 10-fold increase and a 10-fold decrease in the number of bacteria were also tested. The kill rate was not affected by these changes. This latter finding is consistent with the observations of Butterfield et al. on other bacterial species (5). Increasing the total chlorine concentration (Fig. 1) predictably enhanced the bactericidal effect, resulting in a 99% kill within the first 5 min at a concentration of 0.5 mg/liter.

Decreasing the pH exerted an effect similar to that of increasing the chlorine concentration (Fig. 2). A contact time of ca. 40 min was required to eliminate 99% of the *Legionella* population at pH 7.6. In contrast, less than 10 min was required at pH 7.0 and less than 5 min was required at pH 6.0.

Temperature also exerted a dramatic influence on the chlorine disinfection of *L. pneumophila* (Fig. 3). The time required for a 99% kill at 0.1 mg of chlorine per liter decreased from 40

min at room temperature to less than 30 min at the higher temperature of 32°C. At 4°C, between 60 and 90 min was required for a 99% kill.

In addition to examining the bactericidal effectiveness of chlorine on a strain of *L. pneumophila* that had been isolated from a river water sample, a number of other environmental and clinical isolates of legionellae were tested (Table 3). All of these isolates were studied under the standard conditions of 0.1 mg chlorine per ml, pH 7.6, and a temperature of 21°C. The contact times necessary to eliminate 99% of these populations were as long or longer than those required for the river isolate of *L. pneumophila* that had been used as the primary test organism. Long contact times were required for the clinical and environmental isolates of *L. pneumophila*, regardless of serogroup or origin, as well as for *L. micdadei*. These results indicate that legionellae can survive for relatively long periods of time at low concentrations of chlorine under a variety of temperatures and levels of pH.

DISCUSSION

Hypochlorites have been employed for the disinfection of water for potable use since 1894 (22). The basis for the establishment of effective levels of chlorine is the susceptibility of *E. coli* and other coliform bacteria. These bacteria have served as indicators of the bacteriological quality of water supplies since the publication of the first edition of *Standard Methods of Water Analysis* in 1905 (1). Some waterborne pathogens have been shown to be more resistant than the coliform bacteria to chlorine (4, 10, 16, 18, 20, 23). These reports and the incidence of diseases, such as hepatitis, giardiasis, and gastroenteritis, have periodically prompted reconsideration of the coliform bacteria as microbial indicators of water sanitary quality (17).

Levels of *L. pneumophila* ranging from 9×10^3 to 3.3×10^7 organisms per ml have been detected by direct immunofluorescence in sur-

TABLE 3. Survival of environmental and clinical *Legionella* isolates under standard conditions^a

Bacteria	Source	% <i>Legionellae</i> surviving after following min of chlorine treatment:							
		1	5	10	30	60	90	120	150
<i>L. pneumophila</i>									
Serogroup 1	Allegheny River	65 ^b	19	13	4	<1	<1	<1	<1
Serogroup 1	Hot water tank	56	19	20	17	6	<1	<1	<1
Serogroup 1	CDC ^c (Philadelphia 1)	85	20	11	10	5	3	<1	<1
Serogroup 6	Hot water tank	47	15	6	6	4	4	2	<1
<i>L. micdadei</i>									
	Hot water tank	31	9	6	4	3	2	<1	<1
	Clinical specimen	55	20	9	6	3	2	<1	<1

^a Free residual chlorine, 0.1 mg/liter; temperature, 21°C; pH, 7.6.

^b Compared with the concentration of legionellae before the addition of chlorine.

^c CDC, Centers for Disease Control.

face waters (14). The recent detection of *L. pneumophila* in the plumbing systems of institutions has raised the suspicion that municipal drinking water systems serve as pathways for this contamination (9, 25). Our study directly involved a measurement of the effectiveness of chlorine in killing *L. pneumophila* and indirectly involved an assessment of the coliform bacteria as indicators of this process. Our results with *E. coli* are consistent with those of earlier workers: a 99% kill of these bacteria is achieved within a very short period of time. In contrast to these results, *L. pneumophila* may survive for periods of longer than 1 h under the same conditions. The bactericidal action of the chlorine is enhanced at higher temperatures and at lower pH levels. These findings are consistent with studies which were done with other bacteria (4, 5). Thus, the survival of *L. pneumophila* in chlorinated waters may vary with the season and geographic area.

As stated previously, the criterion for a sanitary quality of water supplies is elimination of coliform bacteria. Our observation that legionellae are more resistant than coliform bacteria suggests the possibility that small numbers of legionellae may occasionally survive in waters that have been judged to be microbiologically acceptable. This difference in susceptibility to chlorine tends to increase as conditions become less optimal, e.g., higher pH, lower temperature, and lower chlorine concentration. These findings support the hypothesis that small numbers of legionellae may pass through public water supplies and subsequently contaminate internal plumbing systems. It should be noted that, to date, *L. pneumophila* has not been isolated from water in reservoirs or in the water supply mains. Currently available methodology does not appear to be sufficiently sensitive to detect very low numbers of legionellae. Even if these bacteria are present in potable water, the extent of the hazard posed is not entirely clear. Plumbing systems and potable water have been shown to contain legionellae in some institutions in which outbreaks of Legionnaires' disease were occurring (12, 25, 27). However, these bacteria have also been found in natural waters in the absence of any association with disease and in the plumbing systems of institutions in which no or only infrequent sporadic disease had been detected (14, 26, 29).

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From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 4 Oct 2019 15:38:06 +0000
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Smith, Jessica (CDC/DDID/NCIRD/DBD)
Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
Subject: Re: 10-4-19 Legionella Sampling Plan

(b)(5)

(b)(5) My thought is (b)(5)

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From: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>
Sent: Friday, October 4, 2019 11:23:31 AM
To: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>
Cc: Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>
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x]

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(CTR)
Subject: RE: 10-4-19 Legionella Sampling Plan
Attachments: HOSP Thermal Water Sampling Plan 10-4-19.pdf

Hi Troy — I just re-read this email and realized Kurt says they're sampling today. Did you have any thoughts for him? Looping in Jasen and Sooji bc they weren't included below but were on the previous calls.

Thanks (and welcome back)!
Jess

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Hot Springs National Park

Thermal Spring Water Distribution System Flow Chart

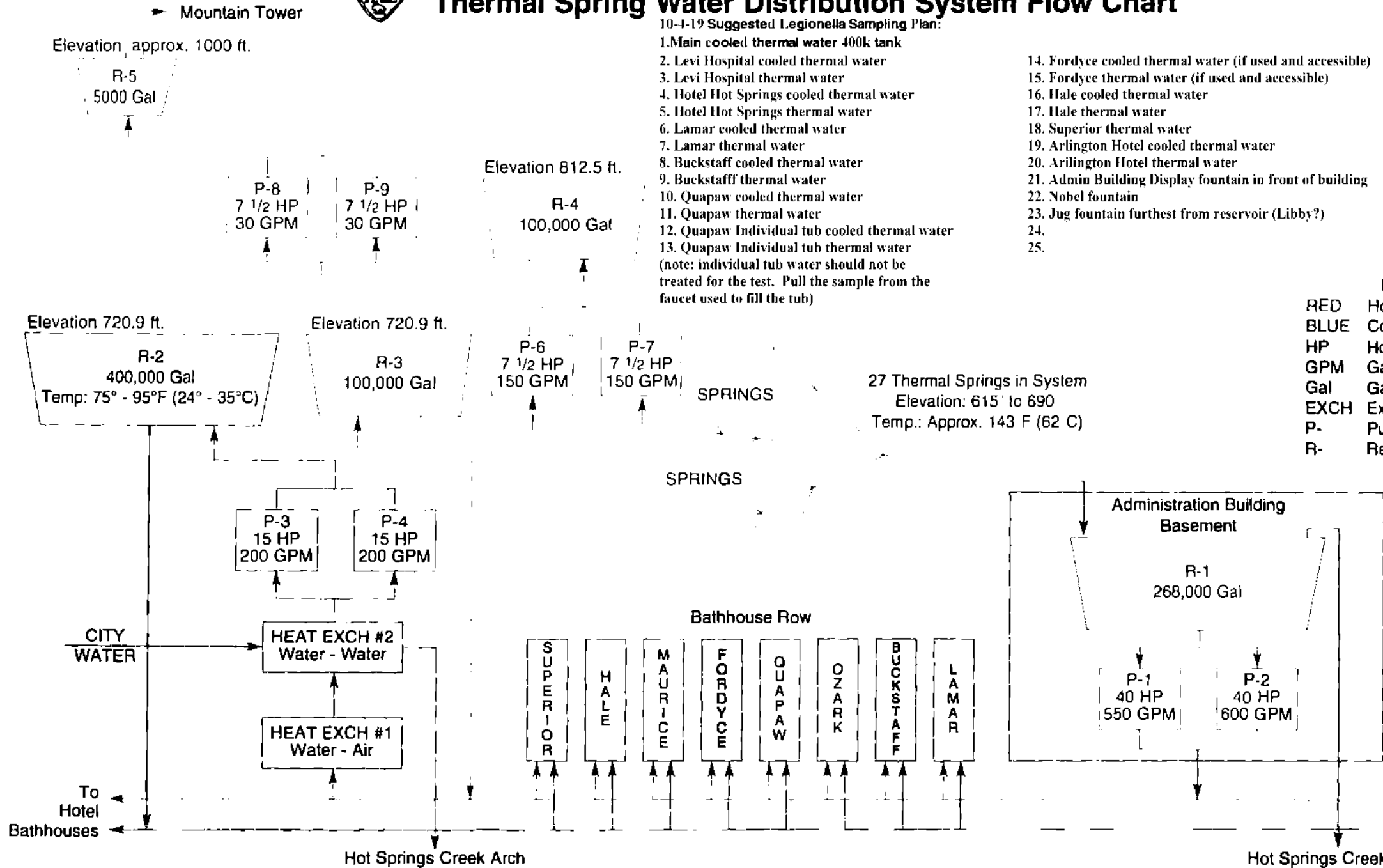
10-4-19 Suggested Legionella Sampling Plan:

1. Main cooled thermal water 400k tank
2. Levi Hospital cooled thermal water
3. Levi Hospital thermal water
4. Hotel Hot Springs cooled thermal water
5. Hotel Hot Springs thermal water
6. Lamar cooled thermal water
7. Lamar thermal water
8. Buckstaff cooled thermal water
9. Buckstaff thermal water
10. Quapaw cooled thermal water
11. Quapaw thermal water
12. Quapaw Individual tub cooled thermal water
13. Quapaw Individual tub thermal water
(note: individual tub water should not be treated for the test. Pull the sample from the faucet used to fill the tub)

14. Fordyce cooled thermal water (if used and accessible)
15. Fordyce thermal water (if used and accessible)
16. Hale cooled thermal water
17. Hale thermal water
18. Superior thermal water
19. Arlington Hotel cooled thermal water
20. Arlington Hotel thermal water
21. Admin Building Display fountain in front of building
22. Nobel fountain
23. Jug fountain furthest from reservoir (Libby?)
- 24.
- 25.

LEGEND:

- RED Hot thermal water
- BLUE Cooled thermal water
- HP Horse Power
- GPM Gallons Per Minute
- Gal Gallons
- EXCH Exchanger
- P- Pump
- R- Reservoir



THE THERMAL WATER DISTRIBUTION SYSTEM OF HOT SPRINGS NATIONAL PARK

Systems for distributing thermal spring water at Hot Springs National Park have been around a long time, evolving along with the bathhouses. In the first half of the nineteenth century most "bathhouses" were rough wooden shacks or even tents, built over natural tufa cavities (sometimes enlarged) that held spring water. More elaborate bathhouses began springing up in the 1850s. Some boasted individual bath rooms with wooden tubs, requiring a network of wooden troughs to direct thermal water into flumes on the roofs. Inside the bathhouse, bathers pulled a rope, opening a mechanism that released water from the flume into the tub.

When a disastrous 1878 fire destroyed most of the bathhouses along Hot Springs Creek, the government seized the opportunity to improve both bathhouse construction and thermal water distribution. The Avenue Hotel Bathhouse, built in 1880, was allowed to set up a pump on the reservation. The first reservoir was built in 1880 as well. On June 8, 1891, a pumping station and reservoir were completed on the present site of the administration building in order to enhance thermal water distribution. Unfortunately a law passed that same year required water to be transported by gravity flow, and the pumping equipment was never used.

The government built more reservoirs in the 1890s to impound spring water and increase the flow. In 1897 all but four springs were encased in brick archways and their water piped to bathhouses and reservoirs; the remaining springs were enclosed by 1901. On November 10, 1903, Congress authorized funds for building surface and deep reservoirs on Hot Springs Mountain, adding to the collection of older reservoirs already in use. In 1924 National Park Service engineers drew a plan showing the existing complex of springs, reservoirs, and plumbing in preparation for the first central collection, impounding and distribution system for the thermal water, completed around 1931. Meters installed on bathhouse lines were not fully functional until 1933. The present system allows better control and monitoring of the water flow.

The springs are located on about 2.8 acres along Bathhouse Row and the Grand Promenade. The bulk of the approximately 850,000 gallons of thermal water flowing each day from Hot Springs Mountain is collected from 27 of the 47

presently active springs. Each spring in the collection system has been sealed and covered with a green box about four feet square with a metal cover, chain, and padlock. The green boxes on the lower west slope of Hot Springs Mountain and the heat exchange units at the north end of Bathhouse Row are the most visible components of the thermal water distribution system and represent its source portion. Not all of the boxes indicate a spring; some hold only valves and collection plumbing. The boxes higher up on the mountain allow access to the underground reservoirs and plumbing.

The valve and spring collection boxes are connected with the plumbing system delivering thermal water to reservoir R-1 under the east end and parking lot of the administration building at the south end of Bathhouse Row. This reservoir holds about 268,000 gallons and includes an overflow pipe connected to the Hot Springs Creek arch.

In the administration building basement, two pumps (P-1 and P-2) move the thermal water through a twelve-inch cast-iron pipe in the Hot Springs Creek arch to the bathhouses, the heat exchangers, and a 100,000-gallon underground storage reservoir (R-3) about 120 feet above Bathhouse Row. The elevation of this reservoir ensures an ample supply of water at about 52 pounds per square inch (psi) when pumps P-1 and P-2 are idle. When demand increases, pumps P-6 and P-7 transfer thermal water from reservoir R-3 to another 100,000-gallon reservoir (R4) about 220 feet above Bathhouse Row. The plumbing for a number of bathhouses no longer in operation is still in the distribution system as well.

Surprisingly enough the water within the distribution system stays well above 100°F (37.8°C); the water has been flowing into it for decades, and the terrain around the reservoirs and plumbing is heat saturated. As a result, the water arriving at the bathhouses is far too hot for direct bathing. By the 1890s most of the bathhouses had individual cooling towers to cool down the thermal water. These and similar towers were used until the central thermal water cooling system was completed on February 8, 1950. The system is comprised of two heat exchangers (#1 and #2), two pumps (P-3 and P-4), and a 400,000-gallon reservoir (R-2). The first exchanger is a thermal water-to-air cooling unit that works like a car radiator; it contains a primary and secondary section,

each with a large fan to force air through its radiator cores. When both sections of heat exchanger #1 are unable to cool the water sufficiently, #2 comes on line. This exchanger runs cold city water over the tubes carrying the thermal water but never mixes with it. The city water, which is heated in the process, is discharged into the Hot Springs Creek arch, and pumps P-3 and P-4 move the cooled thermal water (still 100% spring water) into reservoir R-2. This reservoir is next to and at the same elevation as reservoir R-3, so an ample supply of cooled water is also available at about 52 psi. The system for delivering cooled thermal water is similar to the hot spring water distribution system.

By mixing hot and cooled spring water, attendants can administer baths at the temperature (98° to 100°F, 36.7° to 37.8°C) required by regulations. The system was designed to produce thermal water cooled to temperatures ranging from 75° to 90°F (24° to 32.2°C). During most of the year when outdoor temperatures are below 80°F (26.7°C), the system works well, but during the hot summer months the desired temperature range is difficult to achieve. To compensate, heat exchanger #2 has been redesigned, and installation of new equipment began in the first quarter of fiscal year 2001.

The entire system is monitored automatically from the basement of the park administration building. The quantity and temperature of the water coming in from the springs are recorded continuously for 24 hours a day, as are water levels in each reservoir. Meters at each bathhouse transmit readings on the amount of water used to the monitoring center. Analyses of these data alert maintenance workers to the possibility of major leaks or equipment failure.

One source of equipment failure is the buildup of calcium carbonate, or limestone, in the system. Similar to the water found in caves, the spring water contains dissolved limestone that can be deposited in pipes, valves, and other system components, particularly in those handling cooled spring water. Because calcium carbonate is less soluble in cold water, it settles out in greater quantities in cooled water systems. Also called "tufa," the deposit is left wherever the thermal springs flow. In fact, the porous gray tufa formations behind Bathhouse Row are really geological "maps" showing where the springs once flowed freely down the mountainside.

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>>
>> Does anyone know how quickly PCR results could be turned around? My
>> understanding of PCR is that negative PCR has a high predictive value and could be very useful in
>> this situation if we can get results quickly. Thanks. Maria
>>

From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 25 Nov 2019 15:24:06 +0000
To: Smith, Jessica (CDC/DDID/NCIRD/DBD);Kesteloot, Kurt
Cc: Lucas, Claressa (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Said, Maria;Mark Scott;Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR);Tracy Simmons;Tricia Horn;Robert Bryson;Peter Budde;Sara Newman;Herbert Frost;Patricia Trap;Picavet, Alexandra;Miller, Laura
Subject: Re: Call to Discuss The Latest Legionella Test Results from Arkansas?

Tomorrow between 10-11 am would work best for me.

Troy

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From: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Sent: Monday, November 25, 2019 9:44:15 AM
To: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Cc: Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Said, Maria <maria_said@nps.gov>; Mark Scott <mark_scott@nps.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Tracy Simmons <tracy_simmons@nps.gov>; Tricia Horn <tricia_horn@nps.gov>; Robert Bryson <robert_bryson@nps.gov>; Peter Budde <peter_budde@nps.gov>; Sara Newman <sara_newman@nps.gov>; Herbert Frost <bert_frost@nps.gov>; Patricia Trap <Patricia_Trap@nps.gov>; Picavet, Alexandra <alexandra_picavet@nps.gov>; Miller, Laura <laura_a_miller@nps.gov>
Subject: RE: Call to Discuss The Latest Legionella Test Results from Arkansas?

Good morning Kurt,

From the CDC side, Claressa and I are available this afternoon between 2:00-5:00 pm and tomorrow from either 10:00-11:00 am or between 1:00-5:00 pm (all times ET). I know Jasen is out of office this week but I'm not sure about Troy's availability.

Thanks,
Jessica

—

Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NCIRD/DBD/Respiratory Diseases Branch
404.718.5205 | lyd7@cdc.gov

From: Picavet, Alexandra <alexandra_picavet@nps.gov>
Sent: Monday, November 25, 2019 9:35 AM
To: Miller, Laura <laura_a_miller@nps.gov>
Cc: Kesteloot, Kurt <kurt_kesteloot@nps.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Smith, Jessica

(CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Said, Maria <maria_said@nps.gov>; Mark Scott <mark_scott@nps.gov>; Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR) <npf3@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Tracy Simmons <tracy_simmons@nps.gov>; Tricia Horn <tricia_horn@nps.gov>; Robert Bryson <robert_bryson@nps.gov>; Peter Budde <peter_budde@nps.gov>; Sara Newman <sara_newman@nps.gov>; Herbert Frost <bert_frost@nps.gov>; Patricia Trap <Patricia_Trap@nps.gov>

Subject: Re: Call to Discuss The Latest Legionella Test Results from Arkansas?

I am available.

Alexandra Picavet
Chief of Communications, Legislative Affairs and Partnerships
DOI Regions 3, 4, 5
National Park Service
402-661-1840 (office)
alexandra_picavet@nps.gov
www.nps.gov/

On Mon, Nov 25, 2019 at 8:17 AM Miller, Laura <laura_a_miller@nps.gov> wrote:

Hey Kurt,

Mark is out this week, but I'm here and can be available today or tomorrow. I do have two calls scheduled for today - at 10:15 am CST and at 1:00 pm CST - otherwise I'm free. Tomorrow is completely free.

Thanks!
Laura

On Mon, Nov 25, 2019 at 8:12 AM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:

Good Morning Everyone,

Is there a good time to have a call today or tomorrow regarding the latest test results from Hot Springs, AR? Ultimately, there was one positive sample. That sample came from a long waterline that was flushed but has had little to no use over the last several years. So, I believe the flushing has shown to be one effective step in lowering the risk of Legionella in the water. It would be great to talk to other experts from CDC to hear your perspective.

It would also be great to talk about a press release on the latest round of test results.

There are several other questions to ask and discuss.

On the call I would like to discuss the following:

1. The latest test results and procedure for sampling prior to sampling
2. A list of questions I have
3. Press release information
4. Any additional questions or public health concerns
5. Long-Term plans for drinking water and recreational water
6. Planning for a call with the State Health Department

I look forward to connecting with everyone soon and appreciate any collaboration on this important National Park resource and public health matter.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3, 4, and 5, Great Lakes,
Mississippi Basin, and Missouri Basin
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

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--

Laura A. Miller
Superintendent
Hot Springs National Park
101 Reserve Street
Hot Springs, AR 71901
501.623.2824
870.302.9250 (cell)
501.624.1037 (fax)
www.nps.gov/hosp

x]

From: Kesteloot, Kurt
Sent: 12 Jul 2019 08:27:53 -0500
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Terry.Paul@arkansas.gov
Subject: Re: DRAFT Sampling Plan for Tomorrow's Discussion
Attachments: Legionella DRAFT Sampling Plan 7-11-19.docx

Good Morning,

Here is the latest draft.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service,Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

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On Thu, Jul 11, 2019 at 11:21 PM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:
Good Evening Troy and Terry,

I will try to call you both tomorrow morning sometime. Hopefully around 0700 CDT. I have attached a few documents for your review. These are just a draft and need more review as it is late and I wanted to have something to share with you for our discussion. I have attached old system plans with comments, a MS Word document, and photos.

Talk to you tomorrow.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

×|

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Hot Thermal System:

- Bulk sample and swab admin tank.

Cold Thermal System:

- Sheets two and three of 12 show the location of the cooling tower. Bulk samples are recommended immediately after the cooling towers (equalization). One sample from each if possible and then swab as possible.
- Bulk samples are recommended from the cold thermal line in the Quapaw.
- Any other cooling tower recommendations. Closest a visitor gets to a tower is about 20 ft.

Decorative fountains:

- Sheet 8 of 12 shows the Display fountain and Nobel fountain. It is recommended that both are bulk tested and swabbed if they are in operation.
- Per sheet 2 of 12 there is another fountain in the Arlington lawn that it is recommended to be swabbed and bulk sampled.
- Per sheet 4 of 12, there are two fountains between the Maurice and Fordyce and it is recommended they are both swabbed and bulk tested.
- Are there other decorative fountains that should be tested that I have not listed?

Quapaw Water Processes/Facility:

- Aroma therapy: What is it and is there anything we can test? Swab and bulk sample if possible
- Sheet 4 of 12 shows a 37'8" reservoir under the rooms in the basement of the Quapaw. A swab or two are recommended along with a bulk sample. Test the room(s) closest to the two cases if possible with a swab from opening the hatch.
- There are multiple single use spa tubs in the basement. A mixed bulk sample and swab from multiple or all tubs is recommended if we do not know if the two cases used the same tub.
- Swab the area next to the spring box exposed in the cave and the cave wall if possible. Also verify temperature in the cave.
- Basement fountain swab.
- Anything else they do with water in the basement?
- Fountains in community pools above (yes, swab and possible bulk)
- Showers by pool and basement (swab all shower heads and one bulk downstairs and upstairs at a minimum).

Probably 30 samples.

Other areas in the park?

From: Terry Paul
Sent: 12 Jul 2019 14:37:09 +0000
To: 'Kesteloot, Kurt'; Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Cc: Richard McMullen, Ph.D.
Subject: RE: DRAFT Sampling Plan for Tomorrow's Discussion

Gentlemen,

Let me know as soon as possible about any discussion on the actual taking of the samples. I would suggest starting with the Quapaw since that is the focus of concern. Then moving to the other sites. If we need to collect the samples we will need to get with our laboratory today to see if we have the necessary supplies.

We also suggest at least a look at the ventilation systems and duct work to determine if any moisture is present in those areas.

Thanks Terry!
501-661-2171
501-786-9144

From: Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Sent: Friday, July 12, 2019 8:28 AM
To: tir4@cdc.gov; Terry Paul <Terry.Paul@arkansas.gov>
Subject: Re: DRAFT Sampling Plan for Tomorrow's Discussion

Good Morning,

Here is the latest draft.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Midwest Region
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

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Good Evening Troy and Terry,

I will try to call you both tomorrow morning sometime. Hopefully around 0700 CDT. I have attached a few documents for your review. These are just a draft and need more review as it is late and I wanted to have something to share with you for our discussion. I have attached old system plans with comments, a MS Word document, and photos.

Talk to you tomorrow.

Thank You and Very Respectfully,

Kurt

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601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
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Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

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From: Patricia Trap
Sent: 15 Jul 2019 18:00:41 -0700
To: Kesteloot, Kurt
Cc: Said, Maria; Lauren Miller; Mark Scott; jhenry@atokainc.com; croberts@atokainc.com; Justin Cully; Terry.Paul@arkansas.gov; Richard.McMullen@arkansas.gov; Sara Newman; Gwendolyn Ruppert; Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Alexandra Picavet; Robert Kammel; Clara Wooden
Subject: Re: HOSP-Legionella-Quapaw Update July 15, 2019

Thanks Kurt for this report and diligence in testing. Let me know if you need anything.

Patty

*Regional Director (Acting)
Midwest Region, National Park Service
office: 402-661-1520
cell: 402-637-2414*

On Jul 15, 2019, at 7:37 PM, Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:

Good Evening Everyone,

Thanks for the assistance today! We took several bulk and swab samples in the Quapaw today. We hope to meet tomorrow around 0900 at the Hot Springs Nation Park Headquarters building.

Here is a brief of some of the testing conducted and proposed.

Testing conducted:

Quapaw:

Main Level:

Single Bath Use Area (Room F and G) likely Person 1 and Person 2 rooms for latest scenario.

Room F: Bulk mixed sample of tempered and thermal water (~104.8F) and swab in the jets.

Room G: Bulk thermal sample (~137F), bulk tempered sample (~94F), swab jets and micro bubbles emitter, and remove jet and swab.

Left Pool: Bulk and Swab

Center Pool: Bulk and Swab

Right Pool: Bulk and Swab

Upper Pool:

Shower Heads: Bulk and Swab

Basement:

Shower next to the only individual basement tub that has a skylight (~107F) bulk sample and swab.

Hatch area outside of the cave: excesses waste thermal water in large reservoir (~133F). A bulk sample was taken and two swabs were taken.
Basement Water cascade wall fountain. Occasionally disinfected and was disinfected last week. It uses city water and had a temp of ~74F.
Basement Cave: I was not present but think it was just swabbed.
Please note: the temperatures and samples collected are from memory and the lab recorded the actual numbers. There were approximately 12 swabs may have been gathered along with about 9 bulk samples.

Proposed Testing:

Fountains: Approximately 5 or 6 bulk and swabs
Cooling Tower: Bulk of mixed water (from both towers) and swab of both towers
Tempered (cold) thermal: Cold water at the tank and likely in the Quapaw (Bulk and Swab)
Thermal Water: HQ tank and upper tank (Bulk and Swab)
Quapaw: Swab duct-work in the main bathing area and possibly individual baths area.

Estimated samples remaining are: 11 bulk and 14 swabs.

Thank You and Very Respectfully,

Kurt

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Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕]

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On Fri, Jul 12, 2019 at 3:22 PM Said, Maria <maria_said@nps.gov> wrote:
Situation

- We know of 3 cases of confirmed or suspect Legionnaires' disease associated with Quapaw Bath and Spa, with dates of onset in July 2018, November 2019, and June 2019. The most recent case was unfortunately a death.
- A collaborative team including HOSP, the NPS OPH, and Arkansas Department of Health, all in consultation with the CDC, is working on the public health response to this cluster/outbreak.
- Environmental sampling is planned for early next week.

Updates for July 12, 2019

- Kurt put together a draft sampling plan, a presentation showing photos of the park, and a detailed map of the park for discussion with Troy of CDC and Terry of Arkansas.
- We had call with Quapaw and communicated that (1) we had a third case that was a fatality; (2) we plan additional environmental testing; (2) guest notifications are needed going back one month; (3) clearly visible notifications of all current spa visitors are needed until environmental testing results are back (otherwise the spa would have to close until we have results); (4) we need documentation of the numbers of guests identified with visits over the last month and how many have been reached with notifications; (5) the spa should not change operations in any way or alert employees, so that when we do testing, we get as representative a sample as possible; (6) Dirk Haselow (state epi for Arkansas) and I will need to see and approve the guest notifications and signage for current visitors.
- The Quapaw expressed understanding and agreement with the plan. Later they phoned and asked if people who only came in for massage should be notified as well, and I confirmed with them that all guests, including for massage, should be notified.
- Dirk Haselow (state epi for Arkansas) and I have reviewed drafts of the Guest Notification Letter to previous guests as well as the notifications that will go to current visitors. We have also provided a link to the CDC fact sheet for distribution. The owners expressed that they will can start informing current guests through their sign-in process as early as today.

Please let me know of any edits or additions to this summary.

Maria

From: Hubbard, Brian C. (CDC/DDNID/NCEH/DEHSP)
Sent: 16 Jul 2019 12:23:35 +0000
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: RE: HOSP-Legionella-Quapaw Update July 15, 2019

Thanks Troy.

From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>
Sent: Monday, July 15, 2019 9:49 PM
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Cc: Hubbard, Brian C. (CDC/DDNID/NCEH/DEHSP) <bnh5@cdc.gov>
Subject: Fwd: HOSP-Legionella-Quapaw Update July 15, 2019

Hey LD Team! I didn't see any of you copied on Kurt's email below.

Troy

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From: Patricia Trap <patricia_trap@nps.gov>
Sent: Monday, July 15, 2019 9:01 PM
To: Kesteloot, Kurt
Cc: Said, Maria; Lauren Miller; Mark Scott; jhenry@atokainc.com; croberts@atokainc.com; Justin Cully; Terry.Paul@arkansas.gov; Richard.McMullen@arkansas.gov; Sara Newman; Gwendolyn Ruppert; Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Alexandra Picavet; Robert Kammel; Clara Wooden
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Estimated samples remaining are: 11 bulk and 14 swabs.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS

Supervisory Public Health Consultant, Midwest Region

National Park Service, Office of Public Health (OPH),

601 Riverfront Drive

Omaha, NE 68102

Office Phone: 1-402-661-1718

Office Fax: 1-402-661-1719

Cell Phone: 1-202-641-0055

Email: Kurt_Kesteloot@nps.gov

x]

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Please let me know of any edits or additions to this summary.

Maria

From: Kesteloot, Kurt
Sent: 16 Oct 2019 07:47:42 -0500
To: Said, Maria;Smith, Jessica (CDC/DDID/NCIRD/DBD);Lucas, Claressa (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Lee, Sooji (CDC/DDID/NCIRD/DBD) (CTR)
Cc: Laura Miller;Sara Newman;Mark Scott
Subject: Re: Hot Springs - Culture results
Attachments: Hot Springs NPS Testing Event 10.4.2019.xlsx, 2019 Water Usage HOSP.xlsx

Good Morning Everyone,

Are you available around 10 a.m. central time for a call? If so, I can send a meeting invite.

Also, I have attached water use and temperatures for our discussion.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service,Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

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On Wed, Oct 16, 2019 at 6:24 AM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:
Good Morning Everyone,

I emailed the lab last night requesting the temperatures. I know Mark Scott was present when samples were taken. I believe he mentioned that all samples had a temperature except the cooled thermal water reservoir.

I also requested the water meter readings for each facility. The park has water meter readings for both the cooled and hot thermal water at each location. I look forward to talking to everyone soon. I am open up to 1330 eastern time today.

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

×

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On Tue, Oct 15, 2019 at 9:21 PM Said, Maria <maria_said@nps.gov> wrote:

Hi everyone,

We have received results of the Legionella testing at Hot Springs (attached).

Would you all have availability tomorrow to discuss?

We are not sure what to make of the detection in the hot samples (and can see if they have temperature readings from those water samples to see what the temperature actually was). We also are not sure what to make of the TimeZero vs. Standard ISO results.

Thank you as always for your help sorting through this. It is very much appreciated.

Maria



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www.phigenics.com

CDC ELITE Certified

CHAIN OF CUSTODY FORM

Facility Name : NPS		
Sample Date : 10/04/19	Flush Time : TO TEMP	
Sample Size (in ml) : 250	Number of Samples : 21	
Reason for Sample : Investigative	Method Requested : PVT Premium	
Contact Name(s) : Daniel Ostrand		
Contact Email(s) : dostrand@phigenics.com		

Field ID #	Collector's Name or Initials	Campus	Bldg	Floor #	Rm #	Description	Fixture Type (ex. Sink, Shower, Valve, Dental)	Potable/Utility	Hot / Cold	TEMP	FRO (Free Residual Oxidant)	TRO (Total Residual Oxidant)	pH	PASL #	Notes
1	DO					Admin Display Fountain				103					
2	DO					Nobel Fountain				125					
3	DO		Lamar							137					
4	DO		Buckstaff			4th Tub on Right			Hot	131					
5	DO		Buckstaff			4th Tub on Right			Cold	93					
6	DO		Quapaw			Basement	Valve		Hot	134					
7	DO		Quapaw			Basement	Valve		Cold	79					
8	DO		Quapaw		QE	Individual Tub			Hot	139					
9	DO		Quapaw		QE	Individual Tub			Cold	99					
10	DO		Hale		207				Hot	128					
11	DO		Hale		207				Cold	96					
12	DO		Superior							124					
13	DO		Arlington		2	Tub Room				119					
14	DO		Arlington		2	Tub Room				93					
15	DO		Levi Hospital							122					
17	DO					Cooled Water Reservoir									No Temp Taken
18	DO					Libby Jug Fountain				129					
19	DO					Shell Fountain				126					
20	DO					Display Spring				128					Behind Maurice
21	DO					Cascade Fountain	Pool			124					
22	DO					Cooling Tower	Valve			108					2nd Spicket from left

Relinquished By (Name): Daniel Ostrand	Sample Ship Date: 10/04/19
Received at PASL By (Name):	Received Date:

WATER USAGE BILL OF COLLECTIONS REPORT

BATHHOUSE: ARLINGTON HOTEL
 CALENDAR YEAR 2019

501-623-7771

MONTH	HOT WATER			COOL WATER			TOTAL GALLONS
	PREVIOUS MONTH	CURRENT MONTH	TOTAL	PREVIOUS MONTH	CURRENT MONTH	TOTAL	
JAN	9556000	10380000	824,000	5823000	6070000	247,000	1,071,000
FEB	10380000	10781000	401,000	6070000	6216000	146,000	547000
MAR	10781000	11325000	544,000	6216000	6417000	201,000	745000
APR	11325000	11788000	463,000	6417000	6593000	176,000	639000
MAY	11788000	12289000	501,000	6593000	6888000	295,000	796000
JUN	12289000	12768000	479,000	6888000	7196000	308,000	787000
JUL	12768000	13293000	525,000	7196000	7582000	386,000	911000
AUG	13293000	13673000	380,000	7582000	7883000	301,000	681000
SEP	0	0	-	0	0	-	0
OCT	0	0	-	0	0	-	0
NOV	0	0	-	0	0	-	0
DEC	0	0	-	0	0	-	0
TOTAL			4117000.00	-		2,060,000	6,177,000

Note: Due to government shutdown, Dec 2018 and Jan 2019 are billed together.

WATER USAGE BILL OF COLLECTIONS REPORT

BATHHOUSE: BUCKSTAFF BATHHOUSE 501-623-2308

CALENDAR YEAR 2019

MONTH	HOT WATER			COOL WATER			TOTAL GALLONS
	PREVIOUS MONTH	CURRENT MONTH	TOTAL	PREVIOUS MONTH	CURRENT MONTH	TOTAL	
JAN	8590000	9100000	510000	13579000	13787000	208,000	718000
FEB	9100000	9315000	215000	13787000	13874000	87,000	302000
MAR	9315000	9746000	431000	13874000	14092000	218,000	649000
APR	9746000	10129000	383000	14092000	14257000	165,000	548000
MAY	10129000	10544000	415000	14257000	14461000	204,000	619000
JUN	10544000	10938000	394000	14461000	14672000	211,000	605000
JUL	10938000	11379000	441000	14672000	14983000	311,000	752000
AUG	11379000	11723000	344000	14983000	15197000	214,000	558000
SEP	0	0	0	0	0	0	0
OCT	0	0	0	0	0	0	0
NOV	0	0	0	0	0	0	0
DEC	0	0	0	0	0	0	0
TOTAL			3,133,000			1,618,000	4,751,000

Note: Due to government shutdown, Dec 2018 and Jan 2019 are billed together.

WATER USAGE BILL OF COLLECTIONS REPORT
BATHHOUSE: BUCKSTAFF BATHHOUSE GEOTHERMAL HEAT
CALENDAR YEAR 2019

MONTH	PREVIOUS MONTH	CURRENT MONTH	TOTAL	DIVISOR	GALLONS CHARGED
JAN	15963000	18872000	2,909,000	1,000	2,909
FEB	18872000	20416000	1,544,000	1,000	1,544
MAR	20416000	21747000	1,331,000	1,000	1,331
APR	21747000	22129000	382,000	1,000	382
MAY	22129000	22286000	157,000	1,000	157
JUN	22286000	22351000	65,000	1,000	65
JUL	22351000	22450000	99,000	1,000	99
AUG	22450000	22516000	66,000	1,000	66
SEP	0	0	0	1,000	0
OCT	0	0	0	1,000	0
NOV	0	0	0	1,000	0
DEC	0	0	0	1,000	0
TOTAL			6,553,000		6,553

Note: Due to government shutdown, Dec 2018 and Jan 2019 are billed together.

WATER USAGE BILL OF COLLECTIONS REPORT
 BATHHOUSE: THE HOTEL HOT SPRINGS (501) 623-6600
 CALENDAR YEAR 2019

MONTH	HOT WATER			COOL WATER			TOTAL GALLONS
	PREVIOUS MONTH	CURRENT MONTH	TOTAL	PREVIOUS MONTH	CURRENT MONTH	TOTAL	
JAN	-	-	0	-	-	0	0.00
FEB	0	0	0	0	0	0	0.00
MAR	0	0	0	0	0	0	0.00
APR	0	0	0	0	0	0	0.00
MAY	0	0	0	0	0	0	0.00
JUN	0	0	0	0	0	0	0.00
JUL	0	0	0	0	0	0	0.00
AUG	0	0	0	0	0	0	0.00
SEP	0	0	0	0	0	0	0.00
OCT	0	0	0	0	0	0	0.00
NOV	0	0	0	0	0	0	0.00
DEC	0	0	0	0.00	0.00	0	0.00
TOTAL			-			0	-

Note: Due to government shutdown, Dec 2018 and Jan 2019 are billed together.

WATER USAGE BILL OF COLLECTIONS REPORT

BATHHOUSE: LEVI HOSPITAL

501-622-3334

CALENDAR YEAR 2019

MONTH	HOT WATER			COOL WATER			TOTAL GALLONS
	PREVIOUS MONTH	CURRENT MONTH	TOTAL	PREVIOUS MONTH	CURRENT MONTH	TOTAL	
JAN	16300000	16978000	678,000	74303000	74311000	8000	686000
FEB	16978000	17275000	297,000	74311000	74392000	81000	378000
MAR	17275000	17583000	308,000	74392000	74392000	0	308000
APR	17583000	17816000	233,000	74392000	74392000	0	233000
MAY	17816000	18037000	221,000	74392000	74393000	1000	222000
JUN	18037000	18193000	156,000	74393000	74393000	0	156000
JUL	18193000	18474000	281,000	74393000	74393000	0	281000
AUG	18474000	18582000	208,000	74393000	74393000	0	208000
SEP	0	0	0	0	0	0	0
OCT	0	0	0	0	0	0	0
NOV	0	0	0	0	0	0	0
DEC	0	0	0	0.00	0.00	0.00	0.00
TOTAL			2,382,000			90,000	2,472,000

Note: Due to government shutdown, Dec 2018 and Jan 2019 are billed together.

WATER USAGE BILL OF COLLECTIONS REPORT

BATHHOUSE: HOT SPRINGS MOUNTAIN TOWER 501-623-6035

CALENDAR YEAR 2019

MONTH	PREVIOUS MONTH	CURRENT MONTH	TOTAL GALLONS	COST FOR FIRST GAL	COST FOR ADD. GAL	NUMBER OF ADD GAL
JAN	0	0	0	\$3.52	\$3.52	0
FEB	0	0	0	\$3.59	\$3.52	0
MAR	0	0	0	\$3.59	\$3.52	0
APR	0	0	0	\$3.59	\$3.52	0
MAY	0	0	0	\$3.59	\$3.52	0
JUN	0	0	0	\$3.59	\$3.52	0
JUL	0	0	0	\$3.59	\$3.52	0
AUG	0	0	0	\$3.59	\$3.52	0
SEP	0	0	0	\$3.59	\$3.52	0
OCT	0	0	0	\$3.59	\$3.52	0
NOV	0	0	0	\$3.59	\$3.52	0
DEC	0	0	0	\$3.59	\$3.52	0
TOTAL	0	0	0			0

ng per park management.

WATER USAGE BILL OF COLLECTIONS REPORT

BATHHOUSE: QUAPAW BATHHOUSE

CALENDAR YEAR 2019

MONTH	HOT WATER			COOL WATER		
	PREVIOUS MONTH	CURRENT MONTH	TOTAL	PREVIOUS MONTH	CURRENT MONTH	TOTAL
JAN	10659000	11303000	644,000	2914000	3038000	124,000
FEB	11303000	11886000	583,000	3038000	3144000	106,000
MAR	11886000	12522000	636,000	3144000	3304000	160,000
APR	12522000	12863000	341,000	3304000	3396000	92,000
MAY	12863000	13417000	554,000	3396000	3577000	181,000
JUN	13417000	13927000	510,000	3577000	3733000	156,000
JUL	13927000	14463000	536,000	3733000	3928000	195,000
AUG	14463000	14847000	384,000	3928000	4047000	119,000
SEP	0	0	0	0	0	0
OCT	0	0	0	0	0	0
NOV	0	0	0	0	0	0
DEC	0	0	0	0	0	0
TOTAL			4,188,000			1,133,000

Note: Due to government shutdown, Dec 2018 and Jan 2019 are billed together.

WATER USAGE BILL OF COLLECTIONS REPORT

BATHHOUSE: SPRINGS HOTEL & SPA

501-624-5521

CALENDAR YEAR 2019

MONTH	HOT WATER			COOL WATER			TOTAL GALLONS
	PREVIOUS MONTH	CURRENT MONTH	TOTAL	PREVIOUS MONTH	CURRENT MONTH	TOTAL	
JAN	0	0	0	0	0	0	0
FEB	0	0	0	0	0	0	0
MAR	0	0	0	0	0	0	0
APR	0	0	0	0	0	0	0
MAY	0	0	0	0	0	0	0
JUN	2124000	2229000	105,000	26000	26000	0	105000
JUL	2229000	2373000	144,000	26000	26000	0	144000
AUG	2373000	2495000	122,000	26000	26000	0	122000
SEP	0	0	0	0	0	0	0
OCT	0	0	0	0	0	0	0
NOV	0	0	0	0	0	0	0
DEC	0	0	0	0	0	0	0
TOTAL			371,000			0	371,000

not billed

not billed

The water was turned off and not bills were issued prior to June 2019.

R USAGE BILL OF COLLECTIONS RI
 BATHHOUSE: SUPERIOR BATHHOUSE
 CALENDAR YEAR 2019

MONTH	PREVIOUS MONTH	CURRENT MONTH	TOTAL GALLONS
JAN	585,682	609,402	23,720
FEB	609,402	610,589	1,187
MAR	610,589	621,824	11,235
APR	621,824	632,960	11,136
MAY	632,960	646,220	13,260
JUN	646,220	655,151	8,931
JUL	655,151	669,528	14,377
AUG	669,528	680,447	10,919
SEP	0	0	0
OCT	0	0	0
NOV	0	0	0
DEC	0	0	0

TOTAL 5,031,356 5,126,121 94,765

Note: Due to government shutdown, Dec 2018 and Jan 2019 are billed together.

WATER USAGE BILL OF COLLECTIONS REPORT

BATHHOUSE: HILL WHEATLEY JUG

CALENDER YEAR 2019

MONTH	PREVIOUS MONTH	CURRENT MONTH	TOTAL
JAN	-	-	0
FEB	0.00	0.00	0
MAR	0.00	0.00	0
APR	0.00	0.00	0
MAY	0.00	0.00	0
JUN	0.00	0.00	0
JUL	0.00	0.00	0
AUG	0.00	0.00	0
SEP			0
OCT			0
NOV			0
DEC			0

TOTAL

-

WATER USAGE BILL OF COLLECTIONS REPORT

BATHHOUSE: Administration/Noble JUG

CALENDER YEAR 2018

MONTH	PREVIOUS MONTH	CURRENT MONTH	TOTAL
JAN	0.00	59761.00	59,761
FEB	0.00	35073.00	35,073
MAR	35073.00	70229.00	35,156
APR	70229.00	91356.00	21,127
MAY			0
JUN	0.00	76533.00	76,533
JUL			0
AUG			0
SEP			0
OCT			0
NOV			0
DEC			0
TOTAL	105,302	332,952	227,650

meter reset

WATER USAGE BILL OF COLLECTIONS REPORT

BATHHOUSE: PMC JUG FOUNTAIN

CALENDER YEAR 2018

MONTH	PREVIOUS MONTH	CURRENT MONTH	TOTAL
JAN	0.00	0.00	0
FEB			0
MAR			0
APR			0
MAY			0
JUN			0
JUL			0
AUG			0
SEP			0
OCT			0
NOV			0
DEC			0
TOTAL	-	0	-

From: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Sent: 1 Oct 2019 16:55:38 +0000
To: Smith, Jessica (CDC/DDID/NCIRD/DBD);Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Lucas, Claressa (CDC/DDID/NCIRD/DBD)
Subject: RE: Hot Springs and Water management plans

Thanks again.

I think [redacted (b)(3)]
[redacted (b)(3)]
[redacted (b)(3)] All things to consider.

Jasen

From: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Sent: Tuesday, October 1, 2019 12:51 PM
To: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Yeah, and there are several more sections I didn't copy and paste that [redacted (b)(3)]
[redacted (b)(3)]

From: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>
Sent: Tuesday, October 1, 2019 12:49 PM
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

I think [redacted (b)(3)]
[redacted (b)(3)]

From: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>
Sent: Tuesday, October 1, 2019 12:29 PM
To: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Super helpful.

(b)(3)

(b)(3)

(b)(3)

(b)(5)

From: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>
Sent: Tuesday, October 1, 2019 11:45 AM
To: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Thank you Jess!

Just in case you haven't seen these papers/abstracts, I am forwarding what it seems the most relevant (please see attached).

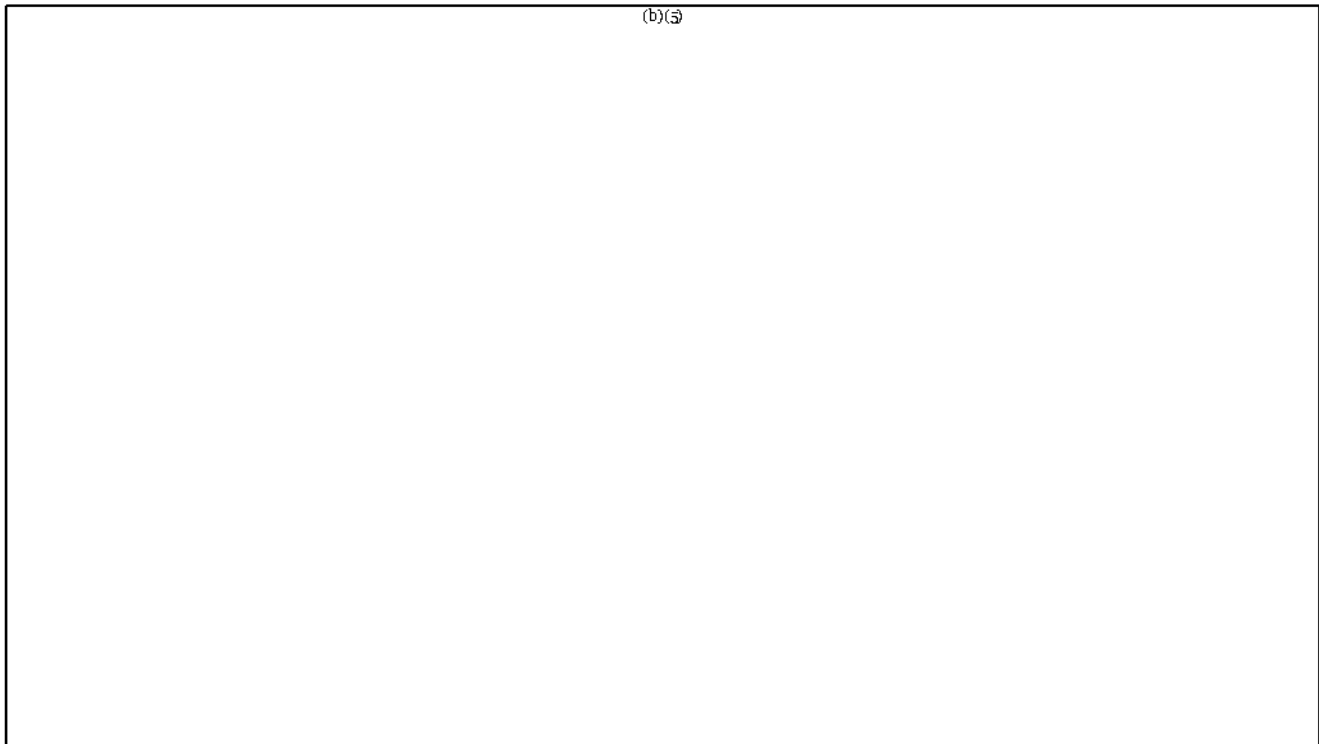
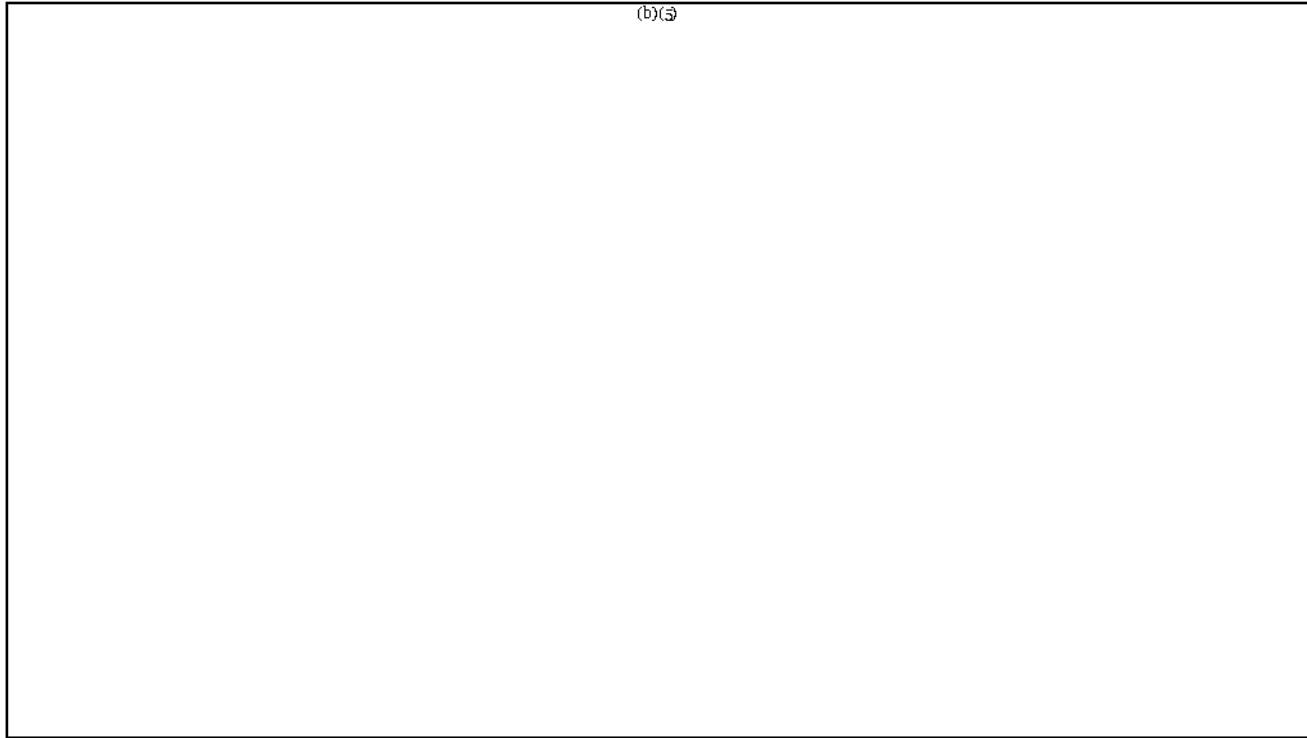
(b)(5)

Thank you,
Natalia

From: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Sent: Tuesday, October 1, 2019 10:27 AM

To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Hi all — Before this call at 2 pm today, I thought I'd pass along this guidance from Japan that seems relevant:



-----Original Appointment-----

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)

Sent: Wednesday, September 18, 2019 5:05 PM

To: Smith, Jessica (CDC/DDID/NCIRD/DBD); Said, Maria; Kesteloot, Kurt; Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Edens, William (Chris) (CDC/DDID/NCIRD/DBD)

Cc: Cooley, Laura A. (CDC/DDID/NCIRD/DBD); James, Allison (CDC arkansas.gov); Lucas, Claessa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD)

Subject: Hot Springs and Water management plans

When: Tuesday, October 1, 2019 2:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).

Where: Skype Meeting

Thanks Maria and Kurt. Let's shoot for 10/1 at 2:00 pm ET, but we can move it if needed.

And please feel free to forward the invitation to Laura Miller or any other folks that you think may be interested in joining (same for the AR DOH side, Allison).

Best regards,

Jessica

Join Skype Meeting

Trouble Joining? [Try Skype Web App](#)

Join by phone

(404) 553-8912,, (b)(6) (Atlanta Dial-in Conference Region)

English (United States)

(855) 348-8390,, (b)(6) Atlanta Dial-in Conference Region)

English (United States)

[Find a local number](#)

Conference ID: (b)(6)

[Forgot your dial-in PIN?](#) | [Help](#)

From: Said, Maria <maria_said@nps.gov>

Sent: Wednesday, September 18, 2019 3:01 PM

To: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Lucas, Claessa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>

Subject: Re: [EXTERNAL] RE: Hot Springs and Water management plans

Hi Kurt,

I think the call will focus on water management plans -- if you think the park would be interested in being part of that discussion, I think it would be fine. We can add Laura Miller and whoever else might be interested in the calendar invite once we have a day/time.

Maria

On Wed, Sep 18, 2019 at 1:49 PM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:

I'm fairly open that week and look forward to talking more. Should we invite a couple people from the Park?

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

On Wed, Sep 18, 2019 at 11:45 AM Said, Maria <maria_said@nps.gov> wrote:

Fantastic.

Tuesday 10/1 is wide open for me too.

The rest of that week I'll be at the IDSA conference and could step out if need be, but it would be less ideal.

Thank you!

Maria

On Wed, Sep 18, 2019 at 11:23 AM Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

Hi Maria,

We're happy to reconvene to discuss WMPs at Hot Springs. Starting tomorrow Troy is going to be traveling internationally, but he's back in the office on the 30th if we could shoot for a time that week? I'm also looping in Jasen and Claressa in case they can join too, since they bring the

ASHRAE perspective and Claressa may be able to speak to the ecology of *Legionella* in this setting.

Right now it looks like Tuesday, 10/1 is wide open for us. Thurs, 10/3 we're free at 3:00 pm and then Friday, 10/4 at 1:00 pm and 3:00 pm ET.

Also, I was hoping we would have heard back from colleagues in Japan by now about any public health recommendations they have for similar settings, but unfortunately we haven't. I do think by the week of the 30th I should be able to do a quick lit review about cases and clusters associated with hot springs and can share any pertinent findings during the call.

Thanks,
Jessica

—

Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NCIRD/DBD/Respiratory Diseases Branch
404.718.5205 lyd7@cdc.gov

From: Said, Maria <maria_said@nps.gov>
Sent: Wednesday, September 18, 2019 9:22 AM
To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Subject: Hot Springs and Water management plans

Hi Laura, Jessica, and Troy,

We (NPS and Arkansas) are trying to figure out the best path forward with the Hot Springs legionella cases. As you know, all the environmental testing has been negative. However, we have had a number of travel-related cases, and, based on Arkansas state data, it looks like there might be increased cases in the Hot Springs area generally compared to the rest of the state -- although these data are still being analyzed, and I would leave it to Arkansas to confirm this.

We also have considered more where the hot spring water is going -- apparently, it does not just go to the Quapaw, but it goes to a number of other concession operated businesses (including another spa) as well businesses outside park property (including a hospital therapeutic pool and at least one other hotel). One action we are considering is sending a letter to those who receive spa water and basically recommending that although we have never identified legionella in the water and don't know of any increased risk, we do know that untreated water does pose a risk for legionella growth, and businesses might want to consider a water management plan. My feeling is that it would be beneficial to them, if we have an additional case, to then be able to clearly describe their water system and the results of some pre-determined parameters (such as temperatures) over time.

If you all are available at any time, I would love to get your thoughts. Some questions I have are:

- Is a water management plan appropriate even for those buildings that don't meet ASHRAE building guidance criteria?
- Is a water management plan needed for only places that don't disinfect? I know that water management plans are used by many systems in which chlorine is used, but in this case, in which we don't have any evidence of Legionella growth in the hot spring water, I don't think we can or should point to hot spring water as a particular Legionella risk -- the risk in my mind is just from the fact that it is not disinfected.
- Should any of the water management plans include legionella testing? I think the Quapaw might consider this -- but then what would be the guidance if they get positive results?

I am including Allison, the new EIS officer for Arkansas on the thread. Dirk Haselow is no longer with the state health department.

Thanks for any thoughts on this. Hope you guys are well.
Maria

--

Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

--

Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Sent: 1 Oct 2019 16:51:29 +0000
To: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Lucas, Claressa (CDC/DDID/NCIRD/DBD)
Subject: RE: Hot Springs and Water management plans

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Office Phone: 1-402-661-1718
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NCIRD/DBD/Respiratory Diseases Branch
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Office Tel: 202-513-7151 | Email: maria_said@nps.gov
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Attachments: FrenchHotSprings2001.pdf

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Different growth rates in amoeba of genotypically related environmental and clinical *Legionella pneumophila* strains isolated from a thermal spa

M. MOLMERET¹, S. JARRAUD¹, J. PIERRE MORIN³, P. PERNIN², F. FOREY¹,
M. REYROLLE¹, F. VANDENESCH¹, J. ETIENNE¹ AND P. FARGE^{1*}

¹ Centre National de Référence des Légionelles EA1655, Faculté de Médecine R. T. H. Laennec, Rue Guillaume Paradin, 69372 Lyon Cedex 08, France

² Laboratoire de Biologie Cellulaire EA 1665, Faculté de Pharmacie, 8 Avenue Rockefeller, 69373 Lyon Cedex 08, France

³ Thermes d'Aix-les-Bains, Place Maurice Mollard, 73013 Aix-les-Bains, France

(Accepted 14 November 2000)

SUMMARY

Two cases of legionellosis occurring 3 years apart were acquired in the same French thermal spa and were apparently due to the same strain of *Legionella pneumophila* serogroup 1, as shown by genomic macrorestriction analysis. Minor differences between the two isolates were found by random amplification PCR profiling which showed an additional band with one of the isolates. Analysis of 107 *L. pneumophila* strains isolated from the spa waters by genome macrorestriction failed to identify the infective strain, but a closely related *L. pneumophila* serogroup 3 strain differing from the clinical isolates by only one band was found. To determine if the clinical *L. pneumophila* serogroup 1 isolates was better adapted for intracellular multiplication than related serogroup 3 environmental isolates, the growth kinetics of six isolates were determined in co-culture with *Acanthamoeba lenticulata*. One clinical isolate failed to grow within amoeba, while the other clinical isolate yielded the highest increase in bacterial cell count per amoeba (1200%) and the environmental isolates gave intermediate values. Genetic analysis of *L. pneumophila* isolates by DNA macrorestriction does not therefore appear to reflect their growth kinetics within amoeba, and is not sufficiently discriminatory to identify potentially virulent strains.

INTRODUCTION

Legionella pneumophila [1] belongs to the *Legionellaceae* family, which comprises at least 43 species [2]. *L. pneumophila* serogroup 1 is most frequently associated with legionellosis. Legionellae are inhaled in aerosols created mainly by hot water distribution systems, cooling towers and thermal spa water [3–7]. *L. pneumophila* is a facultative intracellular pathogen that infects human macrophages, monocytes and epithelial cells [8–10], and in the

aquatic environment, it can survive and multiply within amoebae, which act as natural hosts. Uptake by amoeba and survival of *L. pneumophila* is influenced by environmental conditions such as temperature [11]. Bacteria growing within amoeba are changed phenotypically and exhibit an increased resistance to antibiotics and biocides when compared with cells grown in conventional media [12–14].

In vitro co-culture models have been developed to study the interaction between amoebae and legionella, and the effects of external conditions (temperature, sunlight, etc.) on the growth of the two organisms

* Author for correspondence.

[5, 15, 16], as well as to identify several legionella genes involved in virulence. The growth kinetics of *L. pneumophila* within amoeba such as *Acanthamoeba* spp. [17, 18] and *Hartmannella* spp. [19] vary according to the bacterial strain and extrinsic factors such as the number of subcultures of the strain [20]. Strains lacking *mip* (macrophage infectivity potentiator gene) [21], *dot* (defect in organelle trafficking gene) [22], *icm* (intracellular multiplication gene) [23], *eml* (early stage macrophage-induced locus) [24], and *pmi* (protozoan and macrophage infectivity loci) [25, 26] grow more slowly than the parent strains in coculture. A study of the general stress response of *L. pneumophila* to a modified cellular environment identified the role of *rpoS* gene [27], which regulates genes that enable its survival within the protozoa [28]. Other genes are also required for intracellular survival during the early stages of infection and include *pil BCD*, *eml*-early macrophage induced locus or intracellular replication (*asd*-aspartate semialdehyde deshydrogenase) [29]. A relationship between growth kinetics and virulence is suspected, as *L. pneumophila* strains with the highest growth rate in co-culture also display enhanced entry into mouse or human cells [17, 18, 30, 31].

In 1994 and 1997, *L. pneumophila* type 1 isolates were recovered from two patients who had developed legionellosis at the same French Alpine thermal spa. In order to determine the precise source of infection, legionella isolates from the spa waters were compared to the two clinical isolates by means of pulsed-field gel electrophoresis (PFGE) and random amplified polymorphic DNA (RAPD). The growth kinetics of the clinical and environmental legionella isolates within *Acanthamoeba* sp. were compared to determine whether this parameter reflected virulence *in vivo*.

MATERIALS AND METHODS

Patient and environmental isolates

The clinical isolates were obtained by bronchoalveolar lavage (BAL) from two patients infected during stays at the same thermal spa. Patient 1 (B.P.) was a 40-year-old man with Still's disease, who was receiving 21 mg of prednisone daily and 40 mg of methotrexate weekly. Against medical advice, he attended the thermal spa in July 1994 for a routine 21-day thermal cure. In August 1994, 5 days after returning home, he developed severe acute pneumonia involving both lungs on the chest X-ray film. He was admitted to an

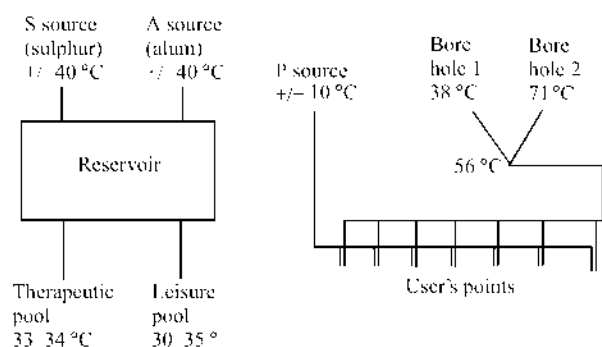


Fig. 1. Schematic diagram of the thermal spa water distribution system.

intensive care unit (ICU), where a BAL fluid sample grew *L. pneumophila* serogroup 1 ($> 10^5$ c.f.u./ml). His condition deteriorated rapidly despite appropriate antibiotic therapy and he became neutropenic (500 G/L). He died on the fourth day in ICU. The clinical strain (SC94) was stored at -80°C .

Patient 2 (F. J.) was a 69-year-old man with chronic obstructive bronchopneumonia who attended the spa in August 1997. Fifteen days after his arrival he developed fever, cough and dyspnoea. Crackles were present and the chest X-ray film showed signs of pneumonia. He received an oral β -lactam antibiotic but his clinical status worsened and he was admitted to an ICU where he was given ofloxacin and cefotaxime, which was replaced with rovamycin when BAL fluid culture yielded *L. pneumophila* serogroup 1 (10 c.f.u./ml). He was cured after 20 days of antibiotic treatment. The clinical strain (SC97) was stored at -80°C .

To determine the source of infection, 11 water samples were collected throughout the spa's distribution system. The thermal spa receives water from three natural springs (S. sulphur; A, alum and P, cold water) and two bore holes (Bh1 and Bh2). Water from these sources are then mixed as shown schematically in Fig. 1, and distributed throughout the buildings at temperatures optimal for the various uses. The 11 samples yielded 107 legionella strains. The environmental isolates were collected over a 2-year period following the second case of legionellosis at the thermal spa. Eighty-one strains were identified as *L. pneumophila* (27 serogroup 1, 1 serogroup 2, 62 serogroup 3, 3 serogroup 6 and 9 serogroup 13), and 26 as *L. dumoffii* (Table 1). Seven isolates came from source A, 6 from source S, and 3 from source P; 44 isolates came from the thermal water distribution network, 13 from pools and 5 from internal reservoirs (Table 1). All strains were identified by a combination

Table 1. PFGE types of the *L. pneumophila* isolates from patients and thermal spa water

Strain designation	Origin	Serogroup	PFGE type
Clinical strains			
SC94	Patient 1	1	U
SC97	Patient 2	1	U
Environmental strains			
AX1-13	User's point	3	A
AX15-26	User's point	3	A
AX28-29	User's point	3	A
AX32	User's point	3	A
AX61	User's point	13	A
AX14	Pool PMI	3	A
AX27	Pool PMI	3	A
AX30 31	Pool PMI	3	A
AX34	User's point	3	B
AX33	User's point	3	C
AX35	User's point	3	D
AX36 37	Reservoir	3	E
AX38	Source A	3	F
AX42	Source A	3	F
AX40	Source S	3	F
AX39	Pool PMI	3	F
AX41	Pool PMI	3	F
AX43	Source S	3	G
AX44	User's point	3	H
AX45 46	Source A	3	I
AX75 77	User's point	6	J
AX72 74	Source A	1	K
AX60	Reservoir	3	L
AX78	Reservoir	2	M
AX55-56	Source S	3	N
AX57	User's point	3	O
AX58-59	Pool PMI	3	P
AX62-68	User's point	13	Q
AX69	User's point	13	R
AX70	Source S	1	S
AX47	Source S	3	T
AX80 81	Source P	1	U
AX71	User's point	1	U
AX48 49	Pool PMI	3	U
AX51	Pool PMI	3	U
AX52	User's point	3	U
AX54	User's point	3	U
AX82	Cold water	3	U
AX50	Reservoir	3	U
AX53	Reservoir	3	U

of biochemical activity [32] and direct fluorescent assay with adsorbed and unadsorbed sera [33]. The reference *L. pneumophila* strain ATCC 33152 was used as a control.

Pulsed field gel electrophoresis (PFGE)

Genomic DNA was prepared as previously described

with some modifications [34, 35]. Briefly, legionellae were treated with proteinase K (50 µg/ml) in TE buffer (10 mM Tris-HCl and 1 mM EDTA, pH 8) for 24 h at 55 °C, and DNA was digested with 20 IU of *Sfi*I restriction enzyme (Boehringer-Mannheim, Meylan, France) for 16 h at 50 °C. Fragments of DNA were separated in 0.8% agarose gel (Fast-Lane, FMC) prepared and run in 0.5 mM Tris-borate-EDTA

buffer (pH 8.3) in a contour-clamped homogeneous field apparatus (CHEF DRII system; Bio-Rad, Ivry sur Seine, France) with a constant voltage of 150 V. Runs were carried out with constant pulse times (25 s) at 10 °C for 11 h and increasing pulse times (35–60 s) at 10 °C for 11 h. The agarose gels were stained with ethidium bromide and photographed under UV light. Band patterns were interpreted with the aid of Taxotron software (Institut Pasteur, Paris, France), based on the unweighted pair grouped with mathematical average (UPGMA) method to construct dendrograms. Isolates with patterns which differed by no more than three restriction fragments were considered to have the same pulsotype, while organisms differing by more than three restriction fragments were considered sufficiently divergent to warrant a separate pulsotype designation [36].

RAPD technique

DNA was extracted from legionellae by a thermal lysis procedure [37] followed by phenol/chloroform/isoamyl alcohol purification and precipitation in absolute ethanol. Random amplification was performed using previously described random primers [24] (Eurogentec, Seraing, Belgium): AP8 (5'-TT-GCTGGCCTAGTTAAACGTA-3') and AP9 (5'-ATGCGTAACCGTAACGTGCTGACT-3'). The reaction mixture consisted of 5 µg of DNA template, 4 mM MgCl₂, 0.2 mM of each dNTP (Pharmacia Biotech, Uppsala, Sweden), 2.5 U of *Taq* DNA polymerase (Amplitaq; Perkin-Elmer Cetus, Branchburg, N.J.), and 50 pmol of each primer in PCR buffer (10 mM Tris-HCl pH 8.3, 50 mM KCl, 0.001% gelatin; Perkin-Elmer Cetus). PCR cycles comprised a 1-min denaturation step at 94 °C, followed by hybridization for 2 min at 30 °C and extension at 72 °C for 1 min (40 cycles) and for 3 min at 72 °C (one final extension cycle). PCR products were run on standard 1.5% agarose gel (SeaKem GTG; FMC BioProducts, Rockland, Maine), stained with ethidium bromide, and photographed under UV light.

Co-culture of legionella with amoebae

Acanthamoeba lenticulata PD2, an axenized reference strain, was cultured in a 10% X-ray-inactivated fetal calf serum casein glucose yeast extract medium

(SCGYEM) at 30 °C. Amoebae were inoculated into 25 cm² tissue culture flasks (Greiner laboratories, Frickenhausen, Germany) containing 14 ml of SCGYEM liquid medium and incubated for 72 h at 30 °C. SCGYEM medium was then replaced by the same volume of saline solution, as previously described [26]. Bacterial strains were grown on buffered charcoal yeast extract (BCYE) agar supplemented with 0.1% α-ketoglutarate, glycine, vancomycin and colistin (GVPC) for 72 h. Co-culture was conducted at 30 °C in saline solution at pH 7 in tissue culture flasks with a ratio of one bacterium per 100 amoebae. Controls included the saline solution alone, with either legionellae or amoebae. Amoebae and legionellae were both quantified after 1, 2 and 3 days. Amoebae were counted directly in the tissue culture flask, using an inverted microscope, and the whole content of a tissue culture flask was removed. Amoebae were lysed by drawing the suspension 3–5 times through a 27-gauge needle [16]. Legionellae (extra- and intracellular) were counted by dilution plating in triplicate on GVPC agar with incubation at 35 °C in 2.5% CO₂-air for 5–7 days. The ratio of bacterial increase versus the number of amoeba was calculated for each co-culture. Each experiment was repeated three times and standard errors were calculated from the repeated measurements.

RESULTS

PFGE patterns of the clinical and environmental isolates

Macrorestriction profiles of the 107 environmental and 2 clinical isolates contained 5–15 fragments ranging in size from 50 to 1000 kb. A total of 21 pulsotypes were identified (Fig. 2), strains within a given pulsotype differing by no more than three bands [38]. Pulsotype A was the most frequent, comprising 32 environmental *L. pneumophila* serogroup 3 isolates. The two clinical isolates, SC94 and SC97, both belonged to pulsotype U, as did 11 environmental isolates (3 serogroup 1 and 8 serogroup 3) originating from pools, reservoirs, the thermal water sources, and the cold water source. No profile identical to that of the clinical isolates was identified among the environmental isolates but the profile of the two clinical isolates differed by only a single band from that of five serogroup 3 environmental isolates, and were thus regarded as highly related to the latter.

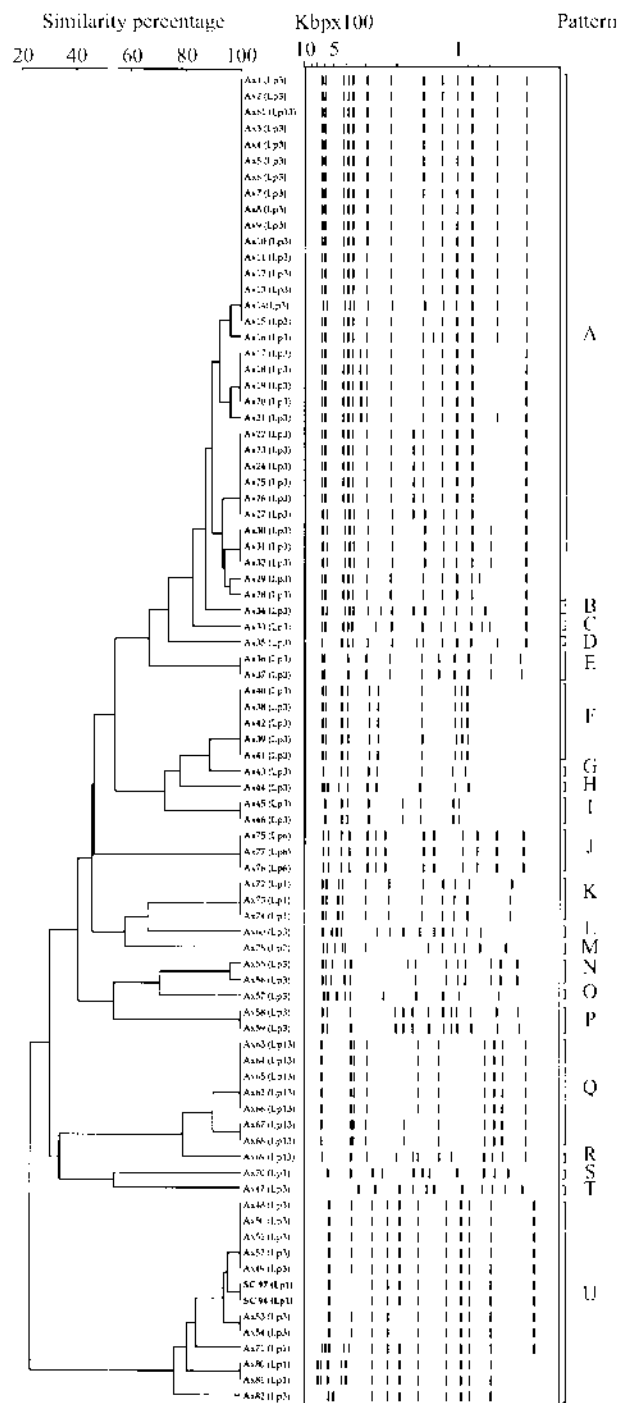


Fig. 2. Dendrogram and schematic representation of the pulsotypes of two clinical and 81 environmental isolates of *Legionella pneumophila*; the error threshold is 4%.

RAPD patterns

To confirm the genetic relatedness of the pulsotype U isolates, the two clinical isolates and four representative pulsotype U environmental isolates were tested by RAPD. The six isolates differed from one another

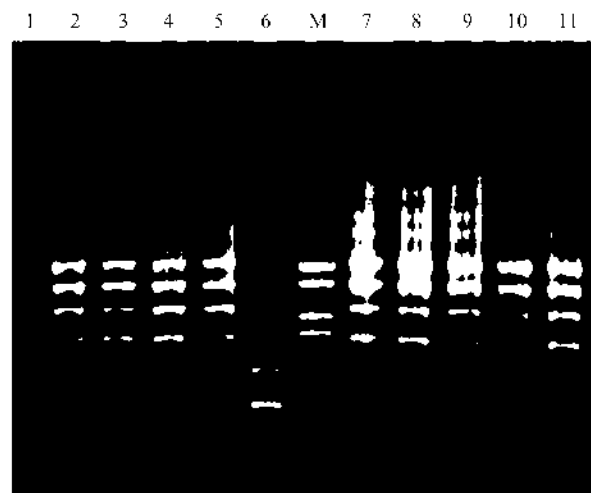


Fig. 3. RAPD patterns of clinical and selected environmental isolates from the thermal spa. Lane 1. negative control (no DNA); lanes 2 and 3. clinical isolates (SC94 and SC97); lanes 4, 8, 9 and 10, environmental isolates of serogroup 1 (A x 71, A x 80, A x 81 and A x 2); lanes 5, 6 and 7, environmental isolates of serogroup 3 (A x 52, A x 54 and A x 82); lane 11. *L. pneumophila* Philadelphia 1; lane M. size markers.

by a maximum of one band, whereas control isolates (one pulsotype A isolate and the reference strain ATCC 33152) differed from the six strains by 3 or 4 bands (Fig. 2). The RAPD profiles of the two clinical isolates differed from each other by one band, while clinical isolate SC97 had a RAPD profile identical to that of environmental isolate A x 71 (Fig. 3, Table 2).

Intra-amoebic growth rates

The six isolates tested above by RAPD were studied for their growth kinetics in culture with *Acanthamoeba lenticulata*. Values differed considerably among the isolates (Fig. 4, Table 2). Interestingly, clinical isolate SC94 showed a 1200% increase in cell count per amoeba, whereas clinical isolate SC97 failed to replicate. Values for the environmental and control isolates were intermediate between those of the two clinical isolates (Table 2). None of the legionella isolates grew in saline alone. Ranking of the isolates according to their intra-amoebic multiplication rate did not reveal the ascendancy of one of the two serogroups and did not correlate with the RAPD patterns (Table 2). For a selected number of cases, co-culture experiments were also performed in the presence of gentamicin to remove extracellular

Table 2. Characteristics of clinical strains and closely related environmental strains of *L. pneumophila*

Strain designation	Bacterial increase per amoeba (%)	PFGE type	RAPD type
Clinical strains			
<i>L. pneumophila</i> serogroup 1 SC94	1200·84	U	A
<i>L. pneumophila</i> serogroup 1 SC97	—1·10	U	B
Environmental strains			
<i>L. pneumophila</i> serogroup 3 AX54	357·16	U	C
<i>L. pneumophila</i> serogroup 3 AX82	103·18	U	E
<i>L. pneumophila</i> serogroup 1 AX71	80·23	U	B
<i>L. pneumophila</i> serogroup 3 AX2	21·90	A	D
<i>L. pneumophila</i> serogroup 3 AX52	17·82	U	C
Reference strain			
<i>L. pneumophila</i> serogroup 1 reference strain ATCC 33152	11·26		E

legionellae. The absolute number of countable bacteria was always lower but the kinetics of growth were similar to those obtained without antibiotics (not shown).

DISCUSSION

Despite the broad range of legionella strains recovered from the water system of this thermal spa, in terms of the number of species and pulsotypes, molecular methods (PFGE and RAPD) suggested that a single strain of *L. pneumophila* serogroup 1 (i.e. a clone) caused two cases of legionellosis that occurred 3 years apart. However, none of the environmental isolates had a pulsotype identical to that of the clinical isolates, and the most closely related profiles were those of several serogroup 3 environmental isolates. This suggested that the serogroup 1 clinical strain may have been derived from a serogroup 3 environmental isolate with a related pulsotype. Indeed, Harrison *et al.* reported that genotypically related strains of *L. pneumophila* could express different serogroup-specific antigens [39, 40]. Other legionella attributes, such as expression of the flagellum, are also modulated by environmental factors [41].

The presence of *L. pneumophila* serogroup 3 along with *L. pneumophila* serogroup 1 and *L. dumoffii* in this thermal spa had been reported in 1988 [6]; unfortunately, these environmental strains were no longer available for this study. More than 10 years later, and despite cleaning programmes and renovation of the water distribution system, the present study shows a very similar species and serogroup

distribution. It should be noted that the use of chlorine is not allowed in French thermal spas in order to preserve the characteristics of the mineral water. Long-term persistence (for up to 10 years) of the same *L. pneumophila* serogroup 6 strain in a hospital water distribution system, and its association with sporadic cases of infection, has been reported [42, 43].

The predominance of serogroup 3 in the water distribution system of this thermal spa, and the involvement of a serogroup 1 strain in the only two cases of legionellosis reported, suggest that the serogroup 1 antigen is better adapted to human infection, while the serogroup 3 antigen may be better adapted to the aquatic environment. *Acanthamoeba*, which is an appropriate model for intracellular multiplication of legionella in mammalian cells [17], was thus used to study the growth of the clinical isolates and closely related environmental isolates of *L. pneumophila*, and its relationship with human virulence. We observed considerable variations in growth rates, even between isolates from the same serogroup (Table 2). Furthermore, the isolate recovered from the patient who died grew rapidly in amoebae, although a differential uptake capacity could play a role, while the other, isolated from the patient who survived, failed to grow at all. Co-culture with macrophages might have given different results. Although patient 1 and 2 had different underlying health problems, our results show that macro-restriction analysis is unable to distinguish between strains with high and low virulence in humans. RAPD, which is an additional discriminatory method to PFGE [42–45], showed that the two clinical strains

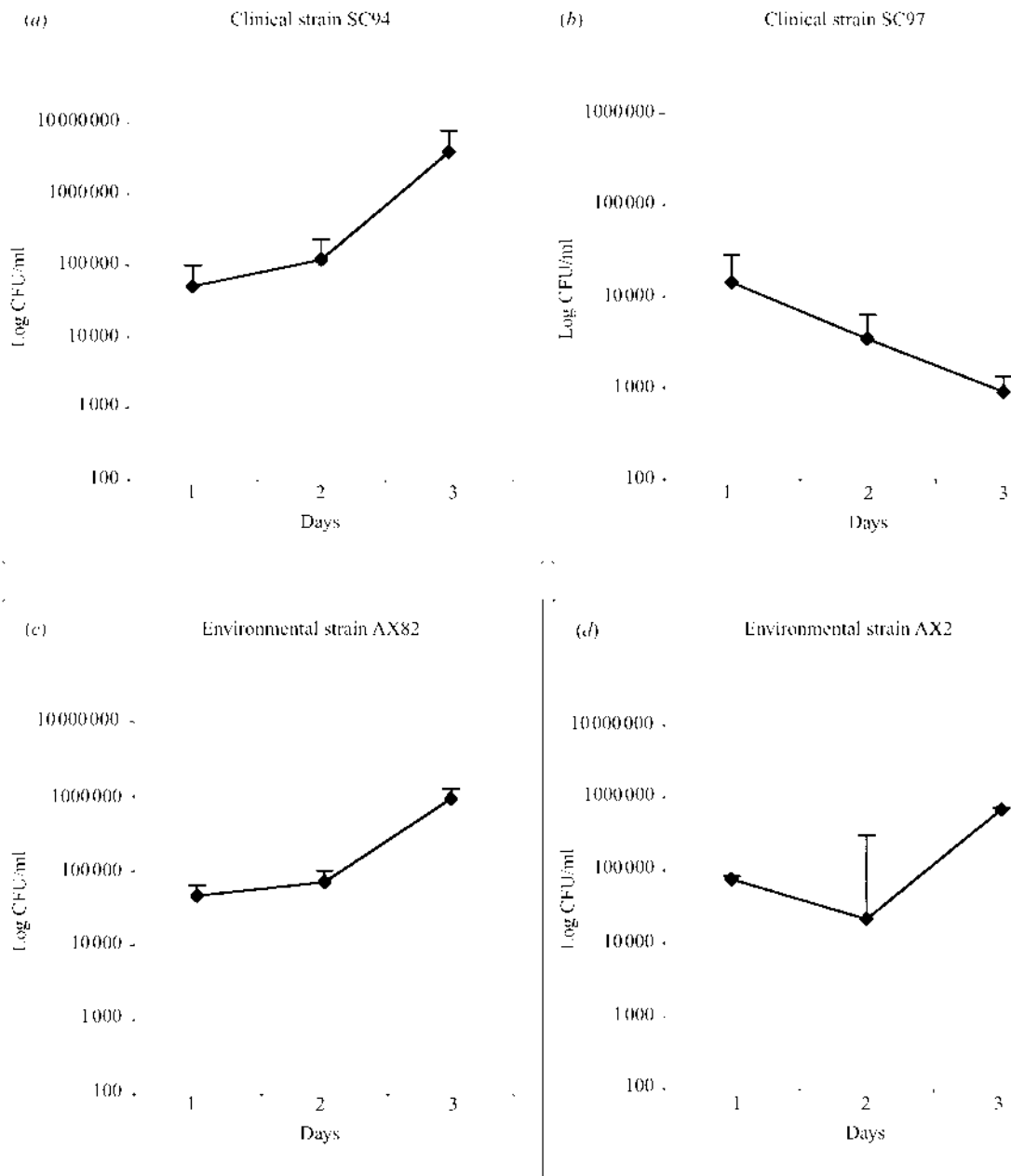


Fig. 4. Growth kinetics of clinical and selected environmental isolates in acanthamoeba. Panel (a), clinical strain SC94; Panel (b), clinical strain SC97; Panel (c), environmental isolate of serogroup 1 (AX82); Panel (d), environmental isolate of serogroup 1 (AX2). Results are given in log c.f.u./ml. with mean type errors.

differed by only one band, possibly corresponding to a genomic domain involved in virulence. Cloning and sequencing of this 0.6 kb RAPD fragment revealed at least one significant 124-amino-acid open reading frame with homology with *Thiosphaera pantotropha* nitrite reductase [identities = 12/49 (24%), positives = 25/49 (50%)] (<http://www.ncbi.nlm.nih.gov/BLAST/>) (data not shown). This potential gene will now be expressed in legionella hosts to test its effect in the amoebic co-culture model.

ACKNOWLEDGEMENTS

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From: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Sent: 1 Oct 2019 16:28:48 +0000
To: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD);Smith, Jessica (CDC/DDID/NCIRD/DBD);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Lucas, Claressa (CDC/DDID/NCIRD/DBD)
Subject: RE: Hot Springs and Water management plans

Super helpful. [redacted] (b)(3)

[redacted] (b)(3)

[redacted] (b)(3)

Are others interpreting this the same?

[redacted] (b)(3)

[redacted] (b)(3)

(b)(5)

From: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>
Sent: Tuesday, October 1, 2019 11:45 AM
To: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Thank you Jess!

Just in case you haven't seen these papers/abstracts, I am forwarding what it seems the most relevant (please see attached).

(b)(5)

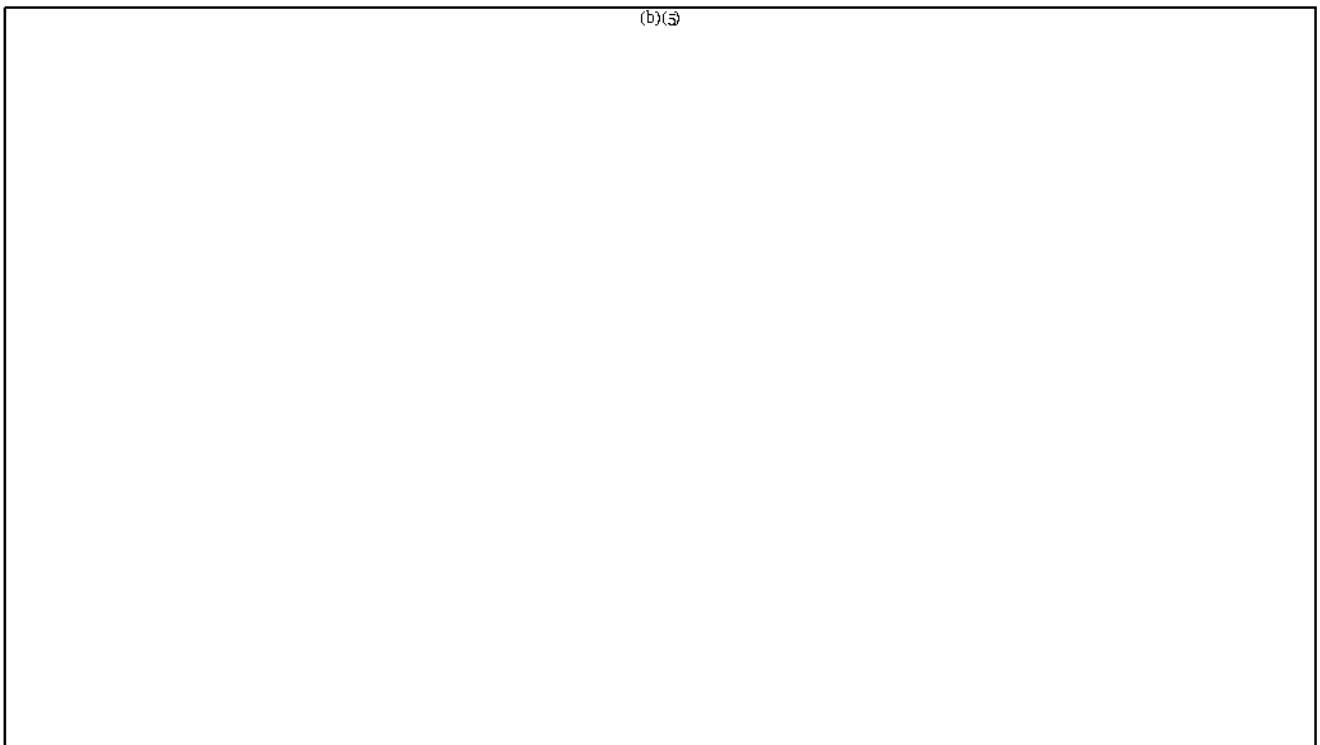
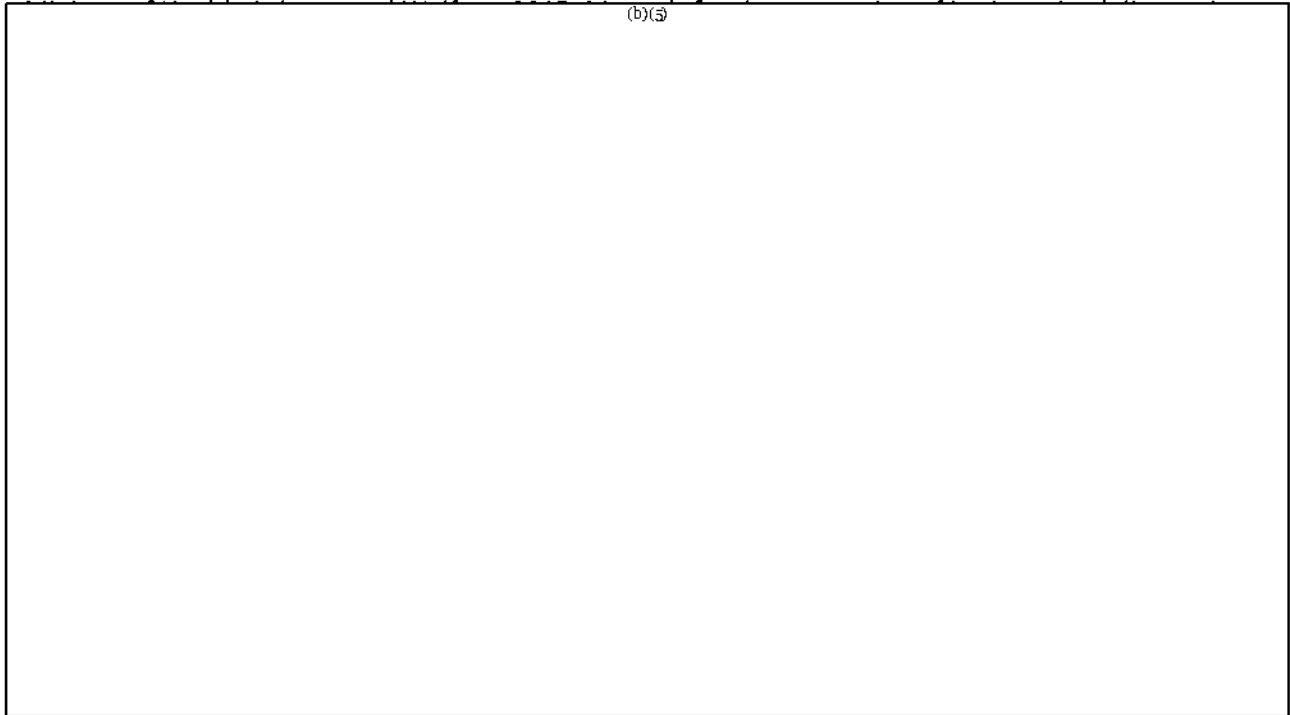
(b)(5)

Thank you,
Natalia

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Sent: Tuesday, October 1, 2019 10:27 AM

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Subject: RE: Hot Springs and Water management plans

Hi all — Before this call at 2 pm today, I thought I'd pass along this guidance from Japan that seems relevant:



-----Original Appointment-----

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)

Sent: Wednesday, September 18, 2019 5:05 PM

To: Smith, Jessica (CDC/DDID/NCIRD/DBD); Said, Maria; Kesteloot, Kurt; Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Edens, William (Chris) (CDC/DDID/NCIRD/DBD)

Cc: Cooley, Laura A. (CDC/DDID/NCIRD/DBD); James, Allison (CDC arkansas.gov); Lucas, Claessa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD)

Subject: Hot Springs and Water management plans

When: Tuesday, October 1, 2019 2:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).

Where: Skype Meeting

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From: Said, Maria <maria_said@nps.gov>

Sent: Wednesday, September 18, 2019 3:01 PM

To: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Lucas, Claessa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>

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CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
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Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

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NCIRD/DBD/Respiratory Diseases Branch
404.718.5205 lyd7@cdc.gov

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From: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD)
Sent: 1 Oct 2019 15:45:09 +0000
To: Smith, Jessica (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);Lucas, Claressa (CDC/DDID/NCIRD/DBD)
Subject: RE: Hot Springs and Water management plans
Attachments: HotSprings2009Kurosawa.pdf, LargestHotSpringOutbreak2004.pdf, Legionella_RecWaters2018.pdf

Thank you Jess!

Just in case you haven't seen these papers/abstracts, I am forwarding what it seems the most relevant (please see attached).

(b)(5)

(b)(5)

Thank you,
Natalia

From: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Sent: Tuesday, October 1, 2019 10:27 AM
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Hi all — Before this call at 2 pm today, I thought I'd pass along this guidance from Japan that seems relevant:

(b)(5)

(b)(3)

-----Original Appointment-----

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)

Sent: Wednesday, September 18, 2019 5:05 PM

To: Smith, Jessica (CDC/DDID/NCIRD/DBD); Said, Maria; Kesteloot, Kurt; Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Edens, William (Chris) (CDC/DDID/NCIRD/DBD)

Cc: Cooley, Laura A. (CDC/DDID/NCIRD/DBD); James, Allison (CDC arkansas.gov); Lucas, Claressa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD)

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Laboratory and Epidemiology Communications

A Case of *Legionella* Pneumonia Linked to a Hot Spring Facility in Gunma Prefecture, Japan

Hajime Kurosawa*, Masahiro Fujita, Satoshi Kobatake, Hirokazu Kimura¹, Mitsuko Ohshima², Akira Nagai², Shingaku Kaneko³, Yasuki Iwasaki¹, and Kunihisa Kozawa

Gunma Prefectural Institute of Public Health and Environmental Sciences, Gunma 371-0052; ¹Infectious Disease Surveillance Center, National Institute of Infectious Diseases, Tokyo 208-0011; ²Gunma Prefectural Government, Gunma 371-8570; and ³Maebashi Red Cross Hospital, Gunma 371-0014, Japan

Communicated by Masahiko Makino

(Accepted December 18, 2009)

Legionnaires' disease, which manifests as pneumonia or the less severe Pontiac fever, has been associated with hot spring facilities and public bath houses in Japan (1). Recent studies suggest the incidence of *Legionella* pneumonia in Japan is increasing (2). Here, we describe a case of *Legionella* pneumonia and identify the probable source of infection as the water from a hot spring facility in Maebashi-shi, Gunma Prefecture, Japan.

The case involves a 64-year-old Japanese male with diabetes mellitus. In February 2008, he often used the same hot spring facility near his home. On February 20, he developed symptoms including a low-grade fever (37.0°C) and a cough. He presented at Maebashi Red Cross Hospital with a high

fever (39.6°C) on February 26 (hospital day 1), with the following clinical data: leukocyte count, $11.3 \times 10^3/\mu\text{L}$ (normal range, $4.0\text{--}9.0 \times 10^3/\mu\text{L}$); platelet count, $1.36 \times 10^7/\mu\text{L}$ ($1.8\text{--}3.5 \times 10^7/\mu\text{L}$); and C-reactive protein level, 24.3 mg/dL (<0.5 mg/dL). Aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were 635 U/L (normal range, 13–33 U/L) and 150 U/L (8–42 U/L), respectively. Renal function was slightly deteriorated (blood urea nitrogen [BUN] value, 28 mg/dL; normal range, 0–20 mg/dL). In addition, chest radiography showed consolidation with an air bronchogram on the bilateral lung. Collectively, the clinical data suggested bacterial pneumonia, complicated by abnormal liver function and low-grade renal failure.

He was given the standard treatment for bacterial pneumonia, including the provision of oxygen (5 L/min) and the administration of the antibiotics ciprofloxacin (600 mg/day, days 1 to 24) and sulfamethoxazole/trimethoprim (800 mg/day, days 2 to 12). The lung lesion showed improvement from hospital day 4 onwards. Aspirated sputum samples were

*Corresponding author: Mailing address: Gunma Prefectural Institute of Public Health and Environmental Sciences, 378 Kamiokimachi, Maebashi-shi, Gunma 371-0052, Japan. Tel: +81-27-232-4881, Fax: +81-27-234-8438, E-mail: kurosawa-ha@pref.gunma.jp

collected and examined by bacterial culture using WYO α agar (Eiken Chemical Co., Ltd, Tokyo, Japan). *Legionella pneumophila* antigen was detected in a urine sample using an immunochromatographic assay (Duopath *Legionella*; Merck KGaA, Darmstadt, Germany) and the bacterium was isolated from the patient's sputum. A diagnosis of *Legionella* pneumonia was therefore confirmed.

Epidemiological data regarding the patient's visit to the hot spring and the subsequent detection and isolation of *L. pneumophila* led the patient's physician to suspect the site of the infection was contaminated water at the hot spring facility. The physician filed with Gunma Prefectural Maebashi Health Center a surveillance report of *L. pneumophila* infection possibly linked to a hot spring.

To confirm the source of *L. pneumophila*, we collected water samples from the relevant hot spring and examined the sample using GVPc agar (bioMérieux, Marcy l'Etoile, France). *L. pneumophila* was detected in the water sample. The isolates of *L. pneumophila* from the patient and hot spring water were identified as serogroup (SG) 1. Using polymerase chain reaction (PCR), we genotyped these isolates as previously described (3,4). In addition, the PCR products, or amplicons, were examined by agarose gel electrophoresis and the isolates from the patient and hot spring water were genotyped as *L. pneumophila* (Fig. 1). We then performed pulsed-field gel electrophoresis (PFGE) with endonuclease *Sfi*I, as previously described (5). PFGE band patterns between isolates taken from the patient and the hot spring water were conclusively matched (Fig. 2), and the isolates were genotyped as *L. pneumophila* (SG1). On the basis of these data, the hot spring operators were deemed in violation of the Public Bath House Law (Issue 7, Item 1) and the Director of the Gunma Prefectural Maebashi Health Center ordered the bath house to close for 2 weeks.

L. pneumophila is the causative agent of *Legionella* pneumonia and Pontiac fever. This pathogen parasitizes amoeba

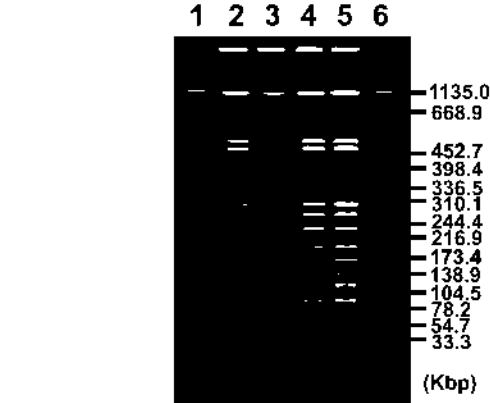


Fig. 2. Photographs of PFGE band patterns of isolates using an endonuclease *Sfi*I cleaved genomic DNAs. Lanes 1 and 6. Molecular size marker; Lanes 2 and 3. PFGE band patterns of isolates derived from hot spring water; Lanes 4 and 5. PFGE band patterns of isolates derived from the patient.

(*Acanthamoeba castellanii*), and it is thought that hot spring water and cooling-tower water provide favorable conditions for the propagation of the amoeba and the pathogen (6). *Legionella* pneumonia may, therefore, be caused by the inhalation of water aerosols contaminated with *L. pneumophila* (7). In Japan, the majority of *Legionella* pneumonia cases are caused by hot spring water contaminated with *L. pneumophila*. Consequently, most Japanese hot spring facilities are now equipped with an engineered closed-water circulation system. When the disinfection of the circulating hot spring water is inadequate, carrier amoebas and *L. pneumophila* may propagate and disseminate.

The case reported here should serve as an important reminder of the risk posed by public water systems as well as of the need for hot spring water facilities to disinfect against *L. pneumophila* and to operate closed water circulation systems to guard against this life-threatening pathogen.

This article appeared in the Infectious Agents Surveillance Report (IASR), vol. 29, 193–194, 2008 in Japanese.

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- Amemura-Maekawa, J., Kura, F., Chang, B., et al. (2005): *Legionella pneumophila* serogroup 1 isolates from cooling towers in Japan form a distinct genetic cluster. *Microbiol. Immunol.*, 49, 1027–1033.
- Ohno, A., Kato, N., Yamada, K., et al. (2003): Factors influencing survival of *Legionella pneumophila* serotype 1 in hot spring water and tap water. *Appl. Environ. Microbiol.*, 69, 2540–2547.

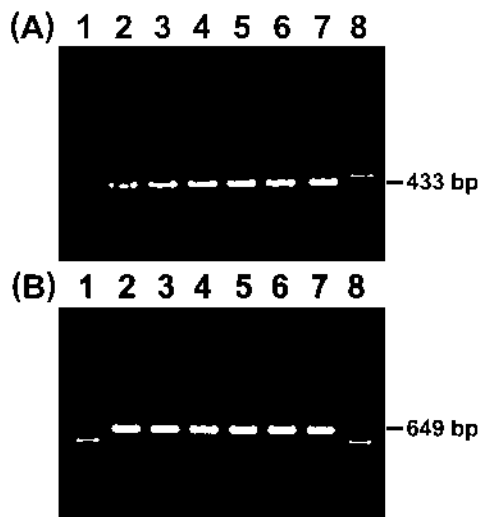


Fig. 1. Agarose gel electrophoresis of the PCR products. (A) Genus *Legionella* 16S rRNA gene 433 bp. (B) *L. pneumophila* macrophage infectivity potentiator gene 649 bp. Amplicons were electrophoresed on a 1.5% agarose gel. Lanes 1 and 8. Marker (100-bp DNA Ladder); Lanes 2, 3, and 4, amplicons derived from isolates of hot spring water; Lanes 5 and 6, amplicons derived from the patient; Lane 7, amplicons derived from ATCC 33152 strain used as a standard.

PubMed Yabuuchi E and 2004

Format: Abstract

Full text links



Kansenshogaku Zasshi. 2004 Feb;78(2):90-8.

[An outbreak of legionellosis in a new facility of hot spring bath in Hiuga City].

[Article in Japanese]

Yabuuchi E¹, Agata K.

Author information

Abstract

Following celebrating ceremony in 20 June 2002, for the completion of Hiuga Sun-Park Hot Spring Bath "Ofunade-no-Yu" facilities, Miyazaki Prefecture, Kyushu Island, 200 neighbors were invited each day to experience bathing on 20 and 21 June. The Bath "Ofunade-no-Yu" officially opened on 1 July 2002. On 18 July, Hiuga Health Center was informed that 3 suspected *Legionella pneumonia* patients in a hospital and all of them have bathing history of "Ofunade-no-Yu". Health Center officers notified Hiuga City, the main proprietor of the Bath business, that on-site inspection on sanitary managements will be done next day and requested the City to keep the bath facilities as they are. On 19 July, Health Center officers collected bath water from seven places and recommended voluntary-closing of "Ofunade-no-Yu" business. Because of various reasons, Hiuga City did not accept the recommendation and continued business up to 23 July. Because *Legionella pneumophila* serogroup 1 strains from 4 patients' sputa and several bath water specimens were determined genetically similar by Pulsed Field Gel Electrophoresis of Sfi I-cut DNA, "Ofunade-no-Yu" was regarded as the source of infection of this outbreak. On 24 July, "Ofunade-no-Yu" accepted the Command to prohibit the business. Among 19,773 persons who took the bath during the period from 20 June to 23 July, 295 became ill, and 7 died. Among them, 34 were definitely diagnosed as *Legionella pneumonia* due to *L. pneumophila* SG 1, by either one or two tests of positive sputum culture, *Legionella*-specific urinary antigen, and significant rise of serum antibody titer against *L. pneumophila* SG 1. In addition to the 8 items shown by Miyazaki-Prefecture Investigation Committee as the cause of infection, Hiuga City Investigation Committee pointed out following 3 items: 1) Insufficient knowledge and understanding of stuffs on *Legionella* and legionellosis; 2) Residual water in tubing system after trial runs might lead multiplication of legionellae in it; and 3) Inadequate disinfection and washing for whole circulation system prior the experience bathing. The Hiuga City Committee directed 24 measures to improve the sanitary condition of the facility

including following 5 items. 1) Fix the manual for maintenance and management of the bath. 2) Keep sufficient overflow of bath water. 3) Put disinfection of filters into practice. 4) Precise measurement and control of the residual chlorine concentration in bath water. 5) Replacement of filtrating material from crushed porous ceramic into natural sand.

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Article

Legionellosis Associated with Recreational Waters: A Systematic Review of Cases and Outbreaks in Swimming Pools, Spa Pools, and Similar Environments

Erica Leoni ^{1,*}, Federica Catalani ², Sofia Marini ³ and Laura Dallolio ¹

¹ Unit of Hygiene, Public Health and Medical Statistics, Department of Biomedical and Neuromotor Sciences, University of Bologna, via S. Giacomo 12, 40126 Bologna, Italy; laura.dallolio@unibo.it

² School of Hygiene and Preventive Medicine, Department of Biomedical and Neuromotor Sciences, University of Bologna, via S. Giacomo 12, 40126 Bologna, Italy; federica.catalani@studio.unibo.it

³ Department of Life Quality Studies, University of Bologna, Campus of Rimini; Corso d'Augusto 237, 47921 Rimini, Italy; sofia.marini2@unibo.it

* Correspondence: erica.leoni@unibo.it; Tel.: +39-051-20948-07

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Abstract: *Legionella* spp. is widespread in many natural and artificial water systems, such as hot water distribution networks, cooling towers, and spas. A particular risk factor has been identified in the use of whirlpools and hot tubs in spa facilities and public baths. However, there has been no systematic synthesis of the published literature reporting legionellosis cases or outbreaks related to swimming/spa pools or similar environments used for recreational purposes (hot springs, hot tubs, whirlpools, natural spas). This study presents the results of a systematic review of the literature on cases and outbreaks associated with these environments. Data were extracted from 47 articles, including 42 events (17 sporadic cases and 25 outbreaks) and 1079 cases, 57.5% of which were diagnosed as Pontiac fever, without any deaths, and 42.5% were of Legionnaires' disease, with a fatality rate of 6.3%. The results are presented in relation to the distribution of *Legionella* species involved in the events, clinical manifestations and diagnosis, predisposing conditions in the patients, favourable environmental factors, and quality of the epidemiological investigation, as well as in relation to the different types of recreational water sources involved. Based on the epidemiological and microbiological criteria, the strength of evidence linking a case/outbreak of legionellosis with a recreational water system was classified as strong, probable, and possible; in more than half of the events the resulting association was strong.

Keywords: *Legionella* spp.; Legionnaires' disease; Pontiac fever; recreational water; hot tubs; whirlpools; spa pools; swimming pools

1. Introduction

Legionellosis is a disease transmitted through the inhalation of particles of aerosolized water contaminated by the opportunistic waterborne pathogen, *Legionella* spp. [1]. After the first recognition of legionellosis in 1976, when 221 participants of the annual convention of the American Legion contracted pneumonia and 34 of them died, surveillance systems were developed and implemented in several countries [2]. Legionellosis surveillance is a current public objective: In 2015, according to the European Centre for Disease Prevention and Control surveillance, 7034 cases were reported in Europe, concerning 1.4 cases per 100,000 inhabitants [3].

The majority of outbreaks described in the literature are correlated to *Legionella pneumophila*, in particular serogroup 1, but other serogroups and species were also associated to human disease, such as *L. micdadei* (now classified as *Tatlockia micdadei*), *L. dumoffii*, and *L. longbeachae* [4]. The two fundamental clinical pictures determined by these infective agents are Legionnaires' disease (LD) and Pontiac fever (PF): The former is generally characterized by an acute pneumonia and, rarely, by an extrapulmonary disease; Pontiac fever is a mild, self-limiting, flu-like illness, which resolves in a few days.

Legionella spp. are widely distributed in both natural (i.e., lakes, rivers, groundwater, thermal water) and man-made aquatic environments, such as the water systems of hospitals, hotels, private houses [5,6], cooling towers [7], dental units [8,9], and recreational [10,11] or therapeutic [12,13] facilities. Any system or equipment which contains, stores, or re-circulates non-sterile water that can be aerosolized is a source of legionellosis [14,15]. Considering these elements, the recreational use of water is an important potential way of exposure to *Legionella* spp., especially in hot water pools equipped with hydromassage systems. A recent review on outbreaks of LD and PF highlights that 14% of the reported outbreaks from 2006 to 2017 recognized pools or spas as an attributed or suspected source [16]. The role of these recreational facilities appears even more significant if one considers the growing popularity of private hot tubs and the increasing number of people frequenting public spa pools and similar environments.

Generally, the outbreak analysis and control measures, specific for each exposure setting, are essential tasks of Public Health Authorities, including outbreak surveillance and analysis specifically dedicated to the recreational water context. Epidemiological knowledge about these themes must be constantly updated. To our knowledge, no systematic synthesis or critical appraisal exists of the published literature reporting sporadic cases or outbreaks of LD and/or PF associated with recreational water. In the present study, we performed a systematic review and analysis of investigations on legionellosis cases or outbreaks related to treated and untreated recreational water, including natural waters, swimming pools, spa pools, and similar environments (hot tubs, whirlpools, hot spring baths, etc.), in accordance with the definitions given for these environments by World Health Organization (WHO) guidelines [17].

2. Materials and Methods

In line with the objective of the study, we set out to perform a systematic review of cases and outbreaks of LD and PF associated with recreational aquatic environments, such as swimming and spa pools or natural spas. The literature search was conducted in Medline, including publications from 1 January 1977 (since the disease was first described in 1976) to 31 May 2018, using the following search terms: (Legionella OR legionellosis OR "Pontiac fever" OR "Legionnaires' disease") AND (case* OR cluster* OR outbreak* OR infection* OR investigation OR surveillance) AND ("recreational water" OR spa OR pool OR "swimming pool" OR "hot tub" OR whirlpool OR bath OR "swim spa" OR "turkish bath" OR sauna OR Jacuzzi OR "natural spa" OR "hot spring" OR "thermal spring" OR "warm spring" OR spring OR thermal). The literature search was conducted without language restrictions, on the condition that the articles had an exhaustive abstract in English reporting the information of interest. A further selection of relevant publications was performed using the inclusion and exclusion criteria listed below.

Inclusion criteria:

- Primary studies describing cases/outbreaks of LD or PF originating from recreational water.

Exclusion criteria:

- Not recreational water (hot water system, cooling tower, fountain, network water, therapeutic water, water births);
- environmental studies without cases;
- not primary studies;

- articles focused only on clinical and laboratory aspects;
- abstract not available/ not complete or not exhaustive;
- articles focused on pools used for display only (retail premises, fairs, exhibitions, shows);
- articles evaluating only microbiological risk assessment; and
- hot tubs or pools on cruise ships (due to a recently published systematic review) [18].

Two researchers independently screened titles and abstracts to identify potentially relevant articles and to exclude articles incompatible with the first five exclusion criteria; any disagreements were resolved by discussion with a third author. After the application of the first five exclusion criteria, the full texts of the remaining articles were examined, and any publications exclusively focused on display spas were then excluded, since this type of exposure in environments used for retail premises, fairs, exhibitions, and shows is not directly linked to recreational use. The remaining articles were assigned to three categories related to three different recreational facilities or sources of infection:

- Private hot tub and similar facilities;
- public pools and spas and similar facilities, generally supplied by municipal network water; and
- spa facilities supplied by natural water, or hot spring/thermal water. Subsequently, we applied the last two exclusion criteria to each category.

Data extracted from these publications included: Year, country, case definition, clinical form, type of event (sporadic case or outbreak), number of cases, attack rate, number of hospitalizations and/or deaths, risk factors, laboratory diagnosis, *Legionella* spp. involved, environmental isolates and concentrations (cfu/L), type of recreational water, water supply, and the type of epidemiological study carried out (descriptive, analytical, presence/absence of environmental investigation). An event with multiple cases (at least two) linked in space and time, with a suspected common source, was defined as an outbreak. For each event (both sporadic cases and outbreaks), epidemiological and microbiological criteria were adopted to characterize the strength of evidence linking the legionellosis event with the suspected recreational water system. Table 1 summarizes these criteria.

Table 1. Strength of evidence linking a case/outbreak of legionellosis with a recreational water system.

Strength of Evidence	Epidemiological and Microbiological Criteria
Strong	<ul style="list-style-type: none"> • An analytical epidemiological study demonstrates a significant association between case/outbreak of legionellosis and exposure to the recreational water; and • the same species and serogroups of <i>Legionella</i> spp. are isolated from the water system at any concentration.
	<p>Or</p> <ul style="list-style-type: none"> • Descriptive epidemiology suggests that the case/outbreak is related to the recreational water and excludes obvious alternative explanations; and • <i>Legionella</i> spp. are isolated from the water system at any concentration and environmental isolates show identical genotype profiles of clinical isolates.
Probable	<ul style="list-style-type: none"> • An analytical epidemiological study demonstrates a significant association between case/outbreak of legionellosis and exposure to the recreational water; and • <i>Legionella</i> spp. are not isolated from the recreational water.
	<p>Or</p> <ul style="list-style-type: none"> • Descriptive epidemiology suggests that the case/outbreak is related to the recreational water and excludes obvious alternative explanations; and • the same species and serogroups of <i>Legionella</i> spp. are isolated from the water system at any concentration.
Possible	<ul style="list-style-type: none"> • Descriptive epidemiology suggests that the case/outbreak is related to exposure to the recreational water and excludes obvious alternative explanations; and • <i>Legionella</i> spp. are not isolated from the recreational water.

Data were analysed as the frequency distribution of the different variables included.

3. Results

Of the 326 articles retrieved from Medline, 259 were excluded for the following reasons: 99 investigations did not refer to recreational water, 82 were environmental studies without cases, 4 were not primary studies, 68 articles were focused only on clinical and laboratory aspects, and 6 publications were in a language other than English and did not have an exhaustive English abstract, as shown in Figure 1.

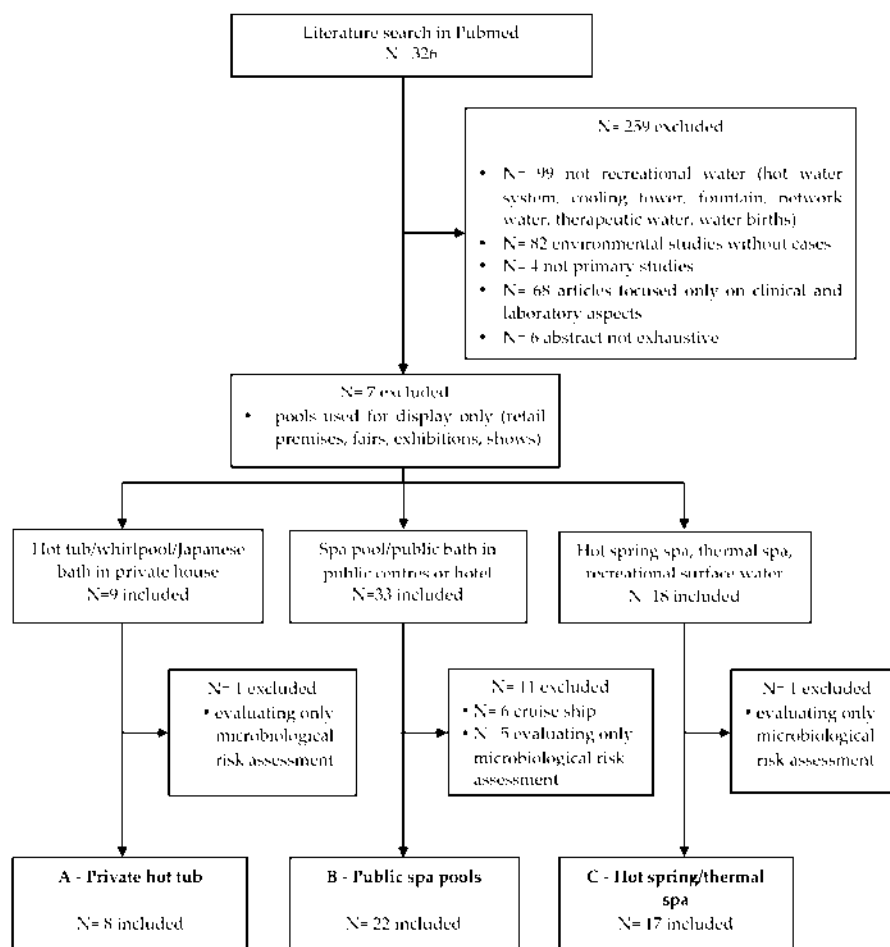


Figure 1. Flow chart of the selection process of articles.

At the end of the selection process, 47 articles were considered eligible for inclusion in the present review, corresponding to 42 events. In four cases, different articles described varying aspects of the same event, while two articles reported two and three different events, respectively. Among the 42 events of legionellosis, eight were linked to a hot tub/whirlpool/Japanese bath used in private houses (Category A in Figure 1, in brief “private hot tub”), 22 were related to whirlpool spa/baths in public centres and hotels (Category B in Figure 2, in brief “public spa pools”), and 12 to hot spring/thermal spa pools (Category C in Figure 1, in brief “hot spring/thermal spa”).

The selected articles were published: Four in the 1980s, 16 in the 1990s, 19 in the 2000s, and three from 2010 to 2018. In 11 articles, the authors did not report the date of onset. The events occurred in different countries across the world, with the highest frequency of hot spring related events in Japan (83.3%) and an overall highest frequency in Japan (18 events: 42.9%), followed by the USA (11 events: 26.2%), and the United Kingdom (4 events: 9.5%).

3.1. Legionellosis in Relation to Recreational Water Source

Table 2 shows all events and cases of legionellosis associated with recreational water systems, distinguished per facility category. Of the 1079 total cases included in the 42 events, 57.5% were diagnosed as PF, without any deaths, and 42.5% were of LD, with a fatality rate of 6.3%.

Table 2. Events of Pontiac fever (PF) and Legionnaires' disease (LD) associated with recreational water.

Characteristics of the Events	Hot Tub/Whirlpool/Japanese Bath in Private House (8 Events)	Spa Pools/Public Baths in Public Centres or Hotels (22 Events)	Hot Spring Spa, Thermal Spa, Recreational Surface Water (12 Events)	Total Recreational Waters (42 Events)
Number of events with single cases	5	2	10	17
Number of outbreaks or events with repeated cases ^a	3	20	2	25
Number of total cases	28	744	307	1079
Median number of cases per outbreak (range)	6 (4–13)	23.5 (3–170)	148.5 (2–295)	23 (2–295)
Total number of PF cases (fatal cases)	22 (0)	598 (0)	0	620 (0)
Total number of LD cases (fatal cases)	6 (1)	146 (16)	307 (12)	459 (29)
Fatality rate on total cases (on LD cases)	3.6% (16.7%)	2.2% (11.0%)	3.9% (3.9%)	2.7% (6.3%)
Analytical epidemiology in outbreak investigation (% of total outbreaks)	0 (0%)	8 (40.0%)	1 (50.0%)	9 (36.0%)
Events with environmental investigation (% of total events)	6 (75.0%)	20 (90.9%)	9 (75.0%)	35 (83.3%)
<i>Legionella</i> spp. detected in environmental water samples (% of total events)	4 (50.0%)	20 (90.9%)	8 (66.7%)	32 (76.2%)
Identical <i>Legionella</i> genotype in clinical and environmental isolates (% of total events)	1 (12.5%)	6 (27.3%)	7 (58.3%)	14 (33.3%)
Strength of evidence				
Strong (%)	1 (12.5%)	15 (68.2%)	7 (58.3%)	23 (52.4%)
Probable (%)	3 (37.5%)	5 (22.7%)	1 (8.3%)	9 (21.4%)
Possible (%)	4 (50.0%)	2 (9.1%)	4 (33.3%)	10 (23.9%)

^a 22 outbreaks and three events with repeated cases or cluster.

The private hot tubs were all supplied by municipal network water and were subjected to a supplementary disinfection system only in two of the eight facilities involved in the legionellosis events. Single cases occurred in five events (62.5%) corresponding to 17.9% of cases, while the remaining three events were outbreaks with a low number of persons involved (from four to 13). LD represented 21.4% of the cases, with a fatality rate of 16.7%.

Public spa pools were generally supplied by municipal network water and only three out of 22 facilities had their own supply system from groundwater (two spa pools) and mountain spring water (one spa pool). In 54.5% of the facilities, water treatment included recycling, filtering, and chemical disinfection with bromine (seven spa pools) or chlorine (five spa pools). In the remaining public spa pools, water disinfection was not mentioned. Public spa pools were responsible for the highest number of events (22), cases (744), and deaths (16). A sporadic case only occurred in 9.1% of the events, while the remaining events were outbreaks often involving a high number of cases of up to 170 [19]. The LD cases formed 19.6% of the total cases, with a fatality rate of 11.0%.

Hot spring/thermal spas were supplied by natural waters, i.e., hot springs and thermal waters. This group also includes the only LD case associated with bathing in surface water. This was a fatal case in a 27-year-old woman who had nearly drowned in estuarine water [20]. Water treatment and chlorine disinfection were reported in only three out of the 11 hot spring/thermal water facilities (27.3%), while, in one case, the authors specified that national regulations (France) precluded the addition of chemicals to thermal spas to preserve the characteristics of the mineral water [21]. All cases linked to this recreational water category were diagnosed as LD, with a fatality rate of 3.9%. Single cases occurred in 83.3% of the events and only two outbreaks were reported. However, one of these was the largest outbreak of LD associated with a hot spring bathhouse in Japan, with 295 cases, including confirmed and probable cases [22].

3.2. Epidemiological Investigations

All the events with sporadic cases were studied by descriptive epidemiology. The epidemiological investigations included an analytical study in 36.0% of outbreaks, with higher percentages in events linked to public spa pools (40.0%) and hot spring/thermal water (50%), compared to private hot tubs (no events with an analytical study). An environmental investigation was carried out in 83.3% of events (private hot tubs and hot spring/thermal water: 75%; public spa pools: 90.9%) and allowed the detection of *Legionella* spp. in 76.2% of the incriminated water sources and to evidence identical molecular profiles of both clinical and environmental isolates in 33.3% of the events. Based on the epidemiological and microbiological criteria specified in Table 1, the strength of evidence linking the case/outbreak of legionellosis with the recreational water system was strong in 23 events (52.4%), with percentages higher for public spa pools (68.2%) and hot spring/thermal water (58.3%) compared to private hot tubs (12.5%). This was a consequence of the previously mentioned differences regarding both the implementation of analytic epidemiology and the detection of environmental *Legionella* spp., which were carried out less frequently in private hot tub related events.

3.3. Events with Sporadic Cases of Legionellosis

Sporadic cases of legionellosis occurred in 17 distinct events, only one of PF [23] and 16 of LD (Table 3), with a fatality rate of 29.4% (31.2% for LD cases). Most cases occurred in Japan (70.6%) [24–35], and hot spring/thermal waters (56.2%) were the facilities most involved, followed by private hot tubs (25%). Only two cases occurred in spa centres/public baths [35,36]. Four cases, three of which fatal, were consequent to near drowning [20,32,35,37] and one case involved a 10-year-old girl, subjected to immunosuppressive therapy for hemosiderosis after being exposed several times to the hot tub in her maternal home [38].

Etiological diagnosis was confirmed by culture of clinical specimens in 75.0% of LD cases and *L. pneumophila* was the species most frequently involved, in particular *L. pneumophila* SG 6 (31.2% of LD cases). No differences were observed on the onset of cases in relation to the different concentrations of legionellae detected from the suspected water sources. Genotyping of clinical and environmental isolates was performed in seven out of 17 events. In accordance with the microbiological criteria specified in Table 1, the strength of evidence linking the cases with the recreational water system was strong in all the cases confirmed by molecular typing (43.7% of LD cases).

Table 3. Events with sporadic cases of Pontiac fever (PF) and Legionnaires' disease (LD) associated with recreational water.

	Pontiac Fever (1 Event) ^a	Legionnaires' Disease (16 Events) ^b
Number of cases (fatal cases)	1 (0)	16 (5)
Gender		
Males		9
Females		6
Not reported	1	1
Median age (range)	37	56.5 (10–88)
Confirmation by culture in clinical specimen	0	12 (75.0%)
<i>Legionella</i> species and serogroup		
<i>L. pneumophila</i> SG 1	0	3 (18.7%)
<i>L. pneumophila</i> SG 2	0	1 (6.2%)
<i>L. pneumophila</i> SG 3	0	2 (12.5%)
<i>L. pneumophila</i> SG 4	0	1 (6.2%)
<i>L. pneumophila</i> SG 6	0	5 (31.2%)
<i>L. pneumophila</i> SG 13	0	2 (12.5%)
<i>L. pneumophila</i> (SG not reported)	1 (100%)	1 (6.2%)
<i>L. rubrilucens</i>	0	1 (6.2%)

Table 3. Cont.

	Pontiac Fever (1 Event) ^a	Legionnaires' Disease (16 Events) ^b
Environmental source		
Private hot tub	1	4 (25.0%)
Public and hotel spa	0	2 (12.5%)
Hot spring/thermal spa	0	9 (56.2%)
Estuarine water	0	1 (6.2%)
Legionella colonization		
<1000 cfu/L	0	2 (12.5%)
1000–10,000 cfu/L	0	2 (12.5%)
>10,000 cfu/L	0	2 (12.5%)
Not reported	1 (100%)	11 (68.7%)
Identical <i>Legionella</i> genotype in clinical and environmental isolates	0	7 (43.7%)
Strength of evidence		
Strong (%)	0	7 (43.7%)
Probable (%)	1 (100%)	2 (12.5%)
Possible (%)	0	7 (43.7%)

^a [23]; ^b [20,24–38].

3.4. Outbreaks of Legionellosis

A total of 25 outbreaks of legionellosis were found: 7 outbreaks of PF (Table 4), 11 outbreaks of LD (Table 5), and 7 mixed events of PF and LD (Table 6). Among the LD events, two were repeated cases on the same site, which occurred in different time periods (No. 2, 3 in Table 6), and one was a long-lasting outbreak with three consecutive clusters (No. 10 in Table 6).

The total number of outbreak cases was 1062, of which 619 were PF cases (58.3%) and 443 were LD cases (41.7%), with 24 deaths (total fatality rate: 2.3%, for LD: 5.4%). Most events occurred in public spas (20/25 outbreaks, 80%), particularly in whirlpool spas of hotels or similar residential facilities, such as inns and holiday resorts (11 of 25 outbreaks, 44%). The attack rate varied from 29.8% to 86.7% for PF outbreaks and from 0.13% to 1.9% for LD outbreaks.

Etiological diagnosis was confirmed by culture of clinical specimens in 10 out of 11 outbreaks of LD and in one out of seven mixed events of PF and LD (61.1% of total events with LD cases), while it was never performed in PF outbreaks. *L. pneumophila* was the species most frequently involved, in particular *L. pneumophila* SG 1 in 68% of total outbreaks (83.3% of outbreaks with LD cases) and SG 6 in 24% of total outbreaks (27.8% of outbreaks with LD cases). In three events, various species or serogroups were identified as responsible for the disease by culture and/or serological assay.

Environmental isolates of *Legionella* spp. were obtained in 22 outbreaks (88%), in seven of which various species or serogroups were detected (28%). Genotyping of clinical and environmental isolates was performed in 10 events (40% of total outbreaks, 55.5% of outbreaks with LD cases). In accordance with the epidemiological and microbiological criteria specified in Table 1, the strength of evidence linking the outbreak with the recreational water system was strong in 16 events (64%).

Table 4. Outbreaks of Pontiac fever (PF) associated with recreational water.

Event No. Country, Year (Reference)	Water System	<i>Legionella</i> spp. (Confirmed Diagnosis Based on)	No. of Cases (Fatal Cases)	Attack Rate	Proportion of Males	Median Age (Range)	Environmental Isolates (cfu/L)	Strength of Evidence
1 Vermont, US, 1981 [39]	Inn whirlpool spa	<i>L. pneumophila</i> SG 6 (antibody titre)	34 (0)	45.9%	53.0%	27.9	<i>L. pneumophila</i> SG 1,6 <i>L. dumoffii</i>	Strong
2 Michigan, US, 1982 [40]	Public whirlpool spa (women's pool)	<i>L. pneumophila</i> SG 6 (antibody titre)	14 (0)	29.8%	0	32 (25–39)	<i>L. pneumophila</i> SG 6	Strong
3 Colorado, US, 1992 [41]	Resort indoor whirlpool	<i>L. pneumophila</i> SG 6 (antibody titre)	13 (0)	38.0%	na	na	<i>L. pneumophila</i> SG 6 (>1,000,000)	Strong
4 Denmark, 1995 [42]	Private summerhouse whirlpool	<i>L. pneumophila</i> SG 1 (culture, antibody titre) <i>L. micdadei</i> (antibody titre)	13 (0)	86.7%	na	na	negative samples (after whirlpool cleaning)	Possible
5 Wisconsin, US, 1998 [43]	Hotel whirlpool spa	<i>L. micdadei</i> (antibody titre)	45 (0)	whirlpool area: 66.0% whirlpool users: 71.0%	na	na	<i>L. micdadei</i> (90,000/L)	Strong
6 Sweden, 1999 [44]	Hotel whirlpool spa	<i>L. micdadei</i> (antibody titre)	29 (0)	whirlpool area: 71.0% whirlpool users: 88.9%	37.9%	41 (21–57)	negative samples	Probable
7 England, 2008 [45]	Resort whirlpool spa	<i>L. pneumophila</i> SG 1 (antibody titre, urinary antigen)	6 (0)	86.0%	0	(24–37)	<i>Legionella</i> non <i>pneumophila</i> (100/L)	Probable

na: Not available; clinical and environmental isolates were never compared by molecular typing.

Table 5. Outbreaks of Legionnaires' disease (LD) associated with recreational water.

Event No. Country, Year (Reference)	Water System	<i>Legionella</i> spp. (Diagnosis Based on)	Number of Cases (Fatal Cases)	Attack Rate	Proportion of Males	Median Age (Range)	Environmental Isolates (cfu/L)	Strength of Evidence
1 Vermont, US, 1987 [28]	Inn whirlpool spa	<i>L. pneumophila</i> SG 1 (culture, antibody titre)	3 (0)	na	na	na	<i>L. pneumophila</i> SG 1,4	Strong
2 Netherlands 1992–96 [17]	Public spa sauna's footbath	<i>L. pneumophila</i> SG 1 (culture)	6 repeated cases (2)	na	83.3%	males: 50 females: 28	<i>L. pneumophila</i> SG 1	Strong
3 France: 1994–97 [21]	Thermal spa	<i>L. pneumophila</i> SG 1 (culture)	2 repeated cases (1)	na	50%	54.5 (40–69)	<i>L. pneumophila</i> SG 1,2,3,6,9,13 <i>L. dumoffii</i>	Strong
4 Japan, 1996 [28]	Public Japanese spa	<i>L. pneumophila</i> SG 1 (antibody titre)	3 (0)	na	na	na	<i>L. pneumophila</i> SG 1	Probable
5 Japan, 2000 [27]	Public bath house	<i>L. pneumophila</i> SG 1,6 (culture, antibody titre, urinary antigen)	23 (2)	0.13%	91.3%	67 (50–86)	<i>L. pneumophila</i> SG 1 (880,000)	Strong
6 Japan, 2000 [29,31]	Public bath house	<i>L. pneumophila</i> SG 1 (culture, antibody titre, urinary antigen)	34 (20 confirmed) (3)	0.20%	65.0% (only confirmed)	62.2 (27–85)	<i>L. pneumophila</i> SG 1,3,5,6 (11400–84200)	Strong
7 Japan, 2002 [23,31–35]	Hot spring bath	<i>L. pneumophila</i> SG 1 (culture, antibody titre, urinary antigen)	295 including suspected cases (7)	1.5%	64.5% (of 76 examined)	65 (9–95)	<i>L. pneumophila</i> SG 1,8 (1,600,000) <i>L. dumoffii</i> (5,200,000) <i>L. londiniensis</i> (15,000,000)	Strong
8 Japan, 2003 [27]	Public bath house	<i>L. pneumophila</i> SG 1 (culture)	9 (1)	0.13%	na	65 (52–82)	<i>L. pneumophila</i> SG 1 (1,300,000)	Probable
9 France, 2010 [36]	Public whirlpool spa	<i>L. pneumophila</i> SG 1 (culture, urinary antigen)	3 (1)	na	33.3%	50 (30–70)	<i>L. pneumophila</i> SG 1 (150,000)	Strong
10 Spain, 2011–12 [37]	Hotel spa pool	<i>L. pneumophila</i> SG 1 (culture)	Total: 44 (6) Cluster1: 21 Cluster2: 2 Cluster3: 3 Cluster4: 18	na	na	tourists: 71.5 hotel workers: 49.5	<i>L. pneumophila</i> SG 1 <i>L. micdadei</i>	Strong
11 Japan, 2015 [38]	Spa house (men's pool)	<i>L. pneumophila</i> SG 1,13 (culture)	7 (0)	na	100%	66.3	<i>L. pneumophila</i> SG 1,13	Strong

na: Not available; clinical and environmental isolates showed correlated molecular profiles in events No. 1, 2, 3, 5, 6, 7, 9, 10, and 11.

Table 6. Outbreaks of Pontiac fever (PF)/Legionnaires' disease (LD) associated with recreational water.

Event No. Country, Year (Reference)	Water System	<i>Legionella</i> spp. (Diagnosis Based on)	Number of Cases PF + LD (Fatal Cases)	Attack Rate	Proportion of Males	Median Age (Range)	Environmental Isolates (cfu/L)	Strength of Evidence
1 Scotland, 1987–88 [19,59]	Hotel whirlpool spa	<i>L. micdadei</i> (antibody titre)	169 + 1 (0)	90.9% (LD: 0.5%)	48.8%	32 (2–72)	<i>L. micdadei</i>	Probable
2 Vermont US, 1991 [60]	Private hot tub in holiday home	<i>L. pneumophila</i> SG 1 (antibody titre)	5 + 1 (0)	na	na	na	not investigated	Possible
3 Georgia US, 1999 [61]	Hotel whirlpool spa	<i>L. pneumophila</i> SG 6 (culture, antibody titre, urinary antigen)	22 + 2 (0)	22.0% (LD: 1.8%)	na	PF: 12 (5–31) LD: 66 (61–71)	<i>L. pneumophila</i> SG 6	Strong
4 Illinois US, 2002 [62]	Hotel spa area	<i>L. micdadei</i> <i>L. maceachernii</i> (antibody titre)	49 + 1 (0)	62.7% (LD: 1.2%)	46%	20 (2–58)	<i>L. micdadei</i> <i>L. maceachernii</i> <i>L. dumoffii</i>	Strong
5 Oklahoma US, 2004 [63]	Hotel pool and hot tub area	<i>L. pneumophila</i> SG 1 (antibody titre, urinary antigen)	101 + 6 (0)	33.7% (LD: 1.9%)	PF: 43.6% LD: 100%	PF: 15 (2–65) LD: 6.5 (2–44)	<i>L. pneumophila</i> SG 1	Strong
6 England, 2006 [64]	Leisure club spa pool	<i>L. pneumophila</i> SG 1 (antibody titre, urinary antigen)	116 + 2 (0)	na	PF: 41.4% LD: 100%	(18–85)	<i>L. pneumophila</i> SG 1	Probable
7 Netherlands, 2009 [65]	Private outdoor whirlpool spa	<i>L. pneumophila</i> SG 1 (antibody titre, urinary antigen)	3 + 1 (1 LD)	na	PF: 66.7% LD: 0%	PF: 54 (52–83) LD: 78	<i>L. pneumophila</i> SG 1	Probable

na: Not available; clinical and environmental isolates showed correlated molecular profiles in the event No. 3.

3.5. Patient Contributing Factors

PF cases showed no evidence of underlying risk factors. The median age of the PF patients, when reported, varied from 12 to 54 years and, overall, males and females were affected with a similar frequency.

LD patients were males in 60% of sporadic cases (Table 3) and in 71.9% of outbreaks, considering only the events reporting gender distribution. The median age was 56.5 years (range: 10–88) in sporadic cases and over 60 years in nine of the 13 LD outbreaks in which the age data was reported. Patient risk factors and underlying medical conditions were specified in 24 of the 34 LD events (71.3%), for a total of 155 cases. Figure 2 shows the occurrence of contributing factors and underlying medical conditions in these patients. Heavy smoking was the most frequent risk factor (58.7% of patients) and, among the underlying medical conditions, cardiovascular diseases (23.9%) and diabetes (11.0%) had the highest prevalence. Four cases of *Legionella* pneumonia occurred after near drowning, one in estuarine water and three in hot spring spas and public baths.

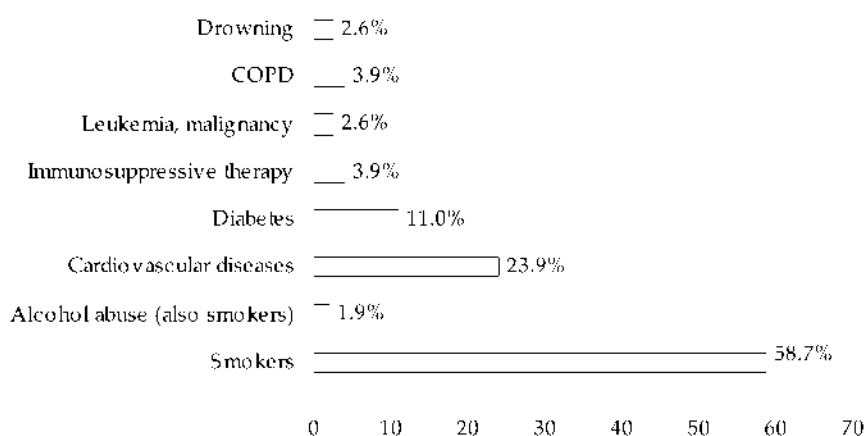


Figure 2. Distribution of underlying medical conditions and risk factors in 155 cases of Legionnaires' disease.

3.6. Environmental Contributing Factors

Excluding the only sporadic case related to estuarine water, environmental contributing factors were investigated in 22 out of 41 events. In only one of these, no contributing environmental conditions were found. In the other 21 events, inadequate water treatment and residual disinfectant below the recommended levels were the most frequent factors that could have favoured the onset of cases or outbreaks. The water temperature was reported in only four events and in three of these the temperature was above 40 °C (Figure 3). In PF events, the most frequent environmental contributing factors were those related to plant maintenance and chemical treatment management (i.e., inappropriate residual disinfectant concentration), while the inadequacy or absence of the treatment system was observed only for LD cases or outbreaks. This could be explained by the fact that many LD events occurred in private hot tubs not subjected to a supplementary disinfection system.

Legionella spp. were isolated from the environmental samples of 32 facilities, at concentrations higher than 10³ cfu/L in water samples obtained from 11 of them (34.4%).

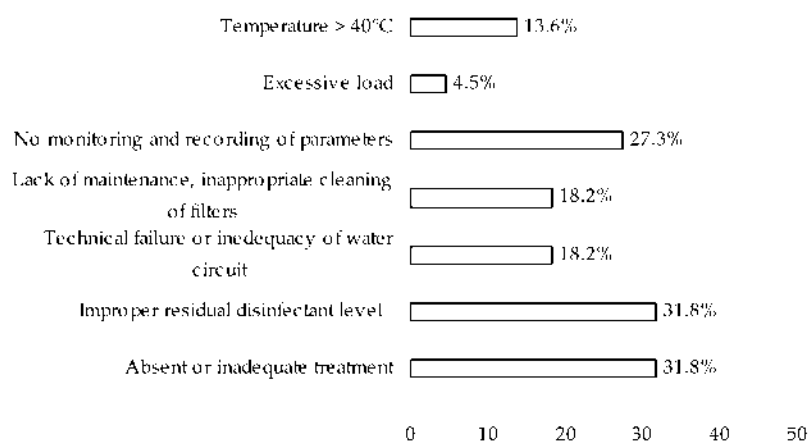


Figure 3. Distribution of environmental contributing factors in 22 recreational facilities associated with legionellosis events.

4. Discussion

This review aimed to evaluate the cases and outbreaks of legionellosis associated with exposure to recreational water since the disease was first described in 1976. Both sporadic cases and outbreaks of LD and PF, described in the scientific literature, were included. Relevant findings from 47 articles were synthesized, including 42 legionellosis events (17 sporadic cases and 25 outbreaks).

4.1. Temporal and Geographical Distribution

The events of legionellosis correlated with exposure to recreational water showed a non-homogeneous distribution over time. In the 1980s, only four events were reported, probably because, in these first years, there was a lower awareness of the problem and many cases were not identified or associated with exposure to recreational water. In the 1990s and 2000s, the number increased (16 and 19 events, respectively) and then declined in the years from 2010 until today (only three reported in the literature). It could be hypothesized that the increase in knowledge and awareness of risks associated with recreational water led to an improvement in the management and maintenance and control measures, also after the issuing of international guidelines on the control of legionellosis in recreational facilities. In 2006, the WHO Guidelines for safe recreational water environments recommended the implementation of safety plans and adequate control measures in pools and hot tubs [17]. Moreover, from 2005, the European Legionnaires' Disease Surveillance Network (ELDSNet, previously EWGLI), with respect to *Legionella* risk reduction in whirlpool spas, recommended continuous treatment with 2–3 mg/L of chlorine or bromine, the checking of these levels almost three times a day, the replacement of at least half of the water each day, sand filters backwashed daily, and cleaning and disinfection of the whole system every day [66]. The implementation of these measures could explain the reduction in the number of events in the most recent period.

The reported events of legionellosis involved 10 countries, with the highest number of events (18) and cases (385) in Japan, where the habit of frequenting hot spring spas and public baths is very widespread, following a long-established tradition in Japanese culture. Moreover, the average water temperature in hot tubs in Japan usually ranges from 40 °C to 43 °C, which is higher than in Europe (30–40 °C) [27].

4.2. Clinical Features and Laboratory Evidence

This review includes both PF and LD events. PF cases totalled 620, only one of which was sporadic, the others being included in 14 outbreaks. The number of PF cases related to recreational water is probably underestimated: The benign nature of the disease, which often presents as an influenza-like

illness, means that the cases, especially when sporadic, are not identified as legionellosis and are, therefore, not subjected to laboratory diagnosis. In the selected PF events, laboratory diagnosis was performed only in outbreaks, and *Legionella* spp. were never culturally isolated. On the contrary, in the events involving LD cases, cultural isolation from patients' specimens allowed the species to be identified in 75% of the sporadic cases and in 11 of the 18 outbreaks with LD cases (61.1%).

Among the different species and serogroups, *L. pneumophila* SG 1 (three sporadic cases and 15 outbreaks of LD) and SG 6 (five sporadic cases and two outbreaks of LD) were the agents most frequently responsible, while, among the other species, *L. micdadei* was implicated in three outbreaks of PF and two outbreaks of mixed PF and LD. In five events, various species or serogroups were involved [27,30,42,58,62], one of which was the first case where the same genotype of *L. rubrilucens* was isolated from the LD patient's sputum and the hot spring water [30].

This review confirms certain known characteristics of the epidemiology of legionellosis. PF cases showed no evidence of underlying risk factors and PF outbreaks had a high attack rate, with no difference between males and females. On the contrary, LD cases prevalently involved males and individuals presenting risk factors, such as smoking and all the underlying medical conditions that reduce immune defenses. In LD outbreaks, the attack rate is low and the fatality rate is high (on average, 6.3%, but up to 31.2% in events related to private hot tubs).

4.3. Recreational Water Facilities and Risk Assessment

Most events occurred in public spa pools (22 events, 744 cases). Of these, 10 were associated with hotels or similar residential facilities and, therefore, fall within the surveillance system for legionellosis linked to travel, which in Europe is carried out by the ELDSNet and coordinated by ECDC. The recreational facilities supplied by natural water (hot spring, thermal water) were the setting for 12 events, 10 of which with a single case. Most studies referring to hot spring/thermal spas (seven out of 11) did not specify if the water was treated or untreated and how the facility was managed; this is a limitation that makes it difficult to draw conclusions about the environmental conditions contributing to these infections.

The recommended standards for *Legionella* spp. in hot tub water range from 0/100 mL to 1000/L in different countries [67]. In the selected studies, the environmental isolates of *Legionella* spp. are reported in 32 events, but only 13 specify the level of contamination, which ranges between 100 cfu/L and $>10^6$ cfu/L. However, it should be noted that the isolation of *Legionella* spp. from environmental samples was carried out after the legionellosis event had occurred and so the environmental conditions may have changed. The lack of data on the *Legionella* concentrations in the water, and on the frequency and duration of exposure, makes it difficult to perform a risk assessment. Various studies tried to estimate the risk for *Legionella* infection due to spa pool use. Bouwknegt et al., (2013) estimated that the infection risk for sitting in an active whirlpool for 15 min ranged from around 3% for a concentration of 10 *L. pneumophila* cfu/L to up to 95% for >1000 cfu/L [68]. These findings suggest that a risk cannot be excluded even in the presence of very low concentrations, and stricter requirements may be needed to ensure adequate protection for users. Azima et al. (2013) suggested a reference value of <1 cfu/L, which is less than the current detection limit [69].

4.4. Epidemiological Investigation and Strength of Evidence

The epidemiological investigation included an analytical study in nine outbreaks, four with a case-control study and five with a retrospective cohort study. In all the events related to private hot tubs, only descriptive epidemiology was carried out. This is justified by the difficulty in such events to find a control group not exposed to the private hot tub. Also, sporadic cases were studied only through descriptive epidemiology (case reports).

The environmental investigation was often delayed with respect to the event onset and, in some cases, was made after control measures had already been adopted. These measures are specified only in a limited number of articles and information is lacking on the follow-up procedures in almost

all the articles. Many studies do not report the environmental conditions that could have favoured such infections. In 19 events, no information is available on the type of water treatment, the level of residual disinfectant, or the state of maintenance of the facility. Only in three events is the water temperature specified, a factor that, in these types of recreational facilities, plays a fundamental role in the development of *Legionella* spp. and was probably co-responsible for three LD cases associated with near drowning in hot spring spas and public baths [32,35,37]. Lying in or sitting up to the neck in hot water (above 40 °C), especially in combination with alcohol consumption, may cause drowsiness, which may then lead to unconsciousness and, consequently, drowning [70].

Based on the selected criteria, the strength of evidence linking the cases/outbreaks to the recreational water facilities was strong in 52.4% of events, probable in 21.4%, and possible in 23.9%. Strong evidence was principally attributable to the results of analytical study in nine events, and to the match of environmental and clinical isolates in 17 events. The comparison between strains of environmental and clinical origin using molecular biology techniques was carried out at a very high level of frequency, especially in cases concerning LD (43.7% of sporadic cases and 81.8% of LD outbreaks).

4.5. Limitations

The present study was limited to articles published in English or with an exhaustive abstract in English, and only peer-reviewed literature was considered. Furthermore, the legionellosis events that are published represent only part of the overall number of cases: Larger LD outbreaks are more likely to be published than sporadic cases and smaller events, especially of Pontiac fever. Also, the review does not include cruise ship cases [18] and cases associated with display spa pools in retail premises, fairs, exhibitions, and shows [71,72], which represent another important source of infection. Therefore, the role of the recreational facilities as a source of infection is underestimated, also considering that in many LD and PF cases the source of *Legionella* remains unknown [3,16].

The heterogeneity of epidemiological investigations, in terms of study design, sample size, and information about the duration of exposure and environmental contributing factors, limited the comparison of results. In particular, the lack of information about the treatment and management of recreational facilities makes it difficult to exhaustively evaluate the role of environmental conditions.

5. Conclusions

Data extracted from the articles in this systematic review show that hot tubs, whirlpools, and spa pools represent an important source of infection of *Legionella* spp., given the number of cases involved (1079 from 1981 to 2015), the number of deaths (29), and the high percentage of events with strong evidence of an association. On the contrary, the risk related to the natural recreational water of rivers and lakes appears negligible: The only sporadic case reported is a case consequent to a near-drowning in estuarine water [20].

Among the cases included in this review, PF cases were the most numerous and were caused by a variety of species and serogroups: *L. pneumophila* SG 6 and *L. micdadei* were the most often responsible agents, while *L. pneumophila* SG 1 was responsible for most LD cases. Unlike PF cases, LD cases prevalently involved individuals presenting risk factors, such as smoking, and underlying medical conditions that reduce immune defenses.

Certain operating conditions that facilitate the formation of aerosol, such as the high temperature of the water and the presence of hydromassage systems, are risk factors inherent to this kind of recreational water. In hot tubs and similar facilities, it is impractical to maintain a water temperature outside the range considered at risk. Therefore, other management strategies need to be implemented, which may include appropriate design and adequate disinfection residual and proper maintenance and cleaning of equipment as well as adequate ventilation. Features, such as water sprays, should be periodically cleaned and flushed with a level of disinfectant adequate to eliminate *Legionella* spp. [3,17,67]. In this review, the environmental conditions were described for

22 events, and in 21 of these (95.5%) at least one of the preventive measures recommended by the various guidelines was not respected. Therefore, it seems important to increase collaboration between the different professionals involved (public health experts, policy makers, facility managers, technical staff, equipment manufacturers) to improve the knowledge of the operators and their awareness of the risk and to favour compliance with control measures.

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Abbreviations

The following abbreviations are used in this manuscript:

LD	Legionnaires' Disease
PF	Pontiac Fever
cfu	colony forming unit

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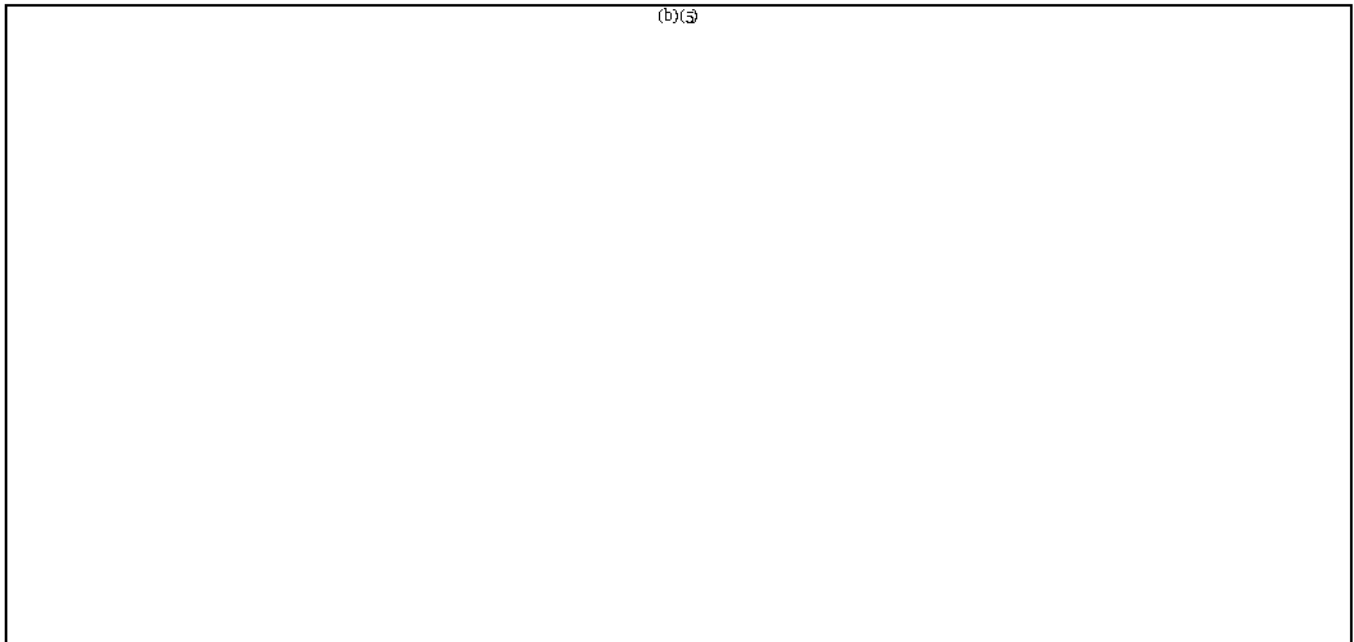
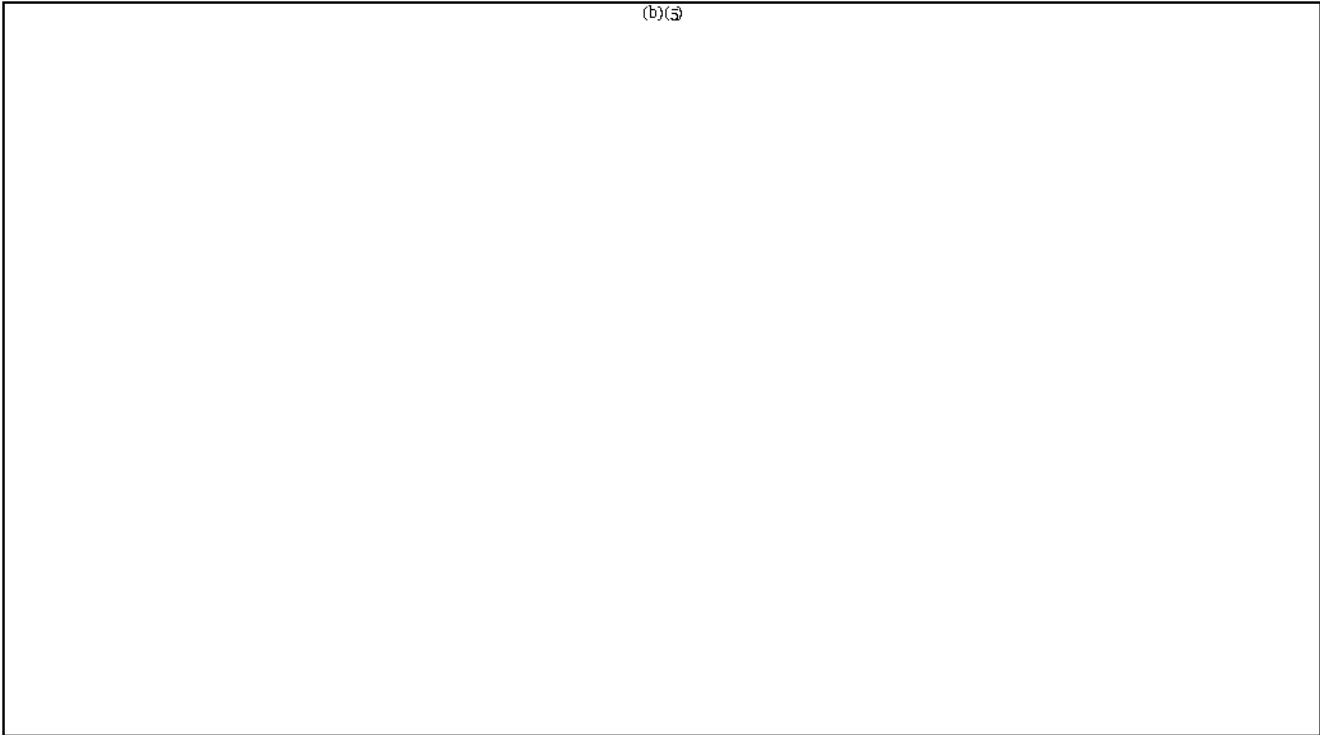
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From: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Sent: 1 Oct 2019 14:26:55 +0000
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Lucas, Claressa (CDC/DDID/NCIRD/DBD); Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD)
Subject: RE: Hot Springs and Water management plans

Hi all — Before this call at 2 pm today, I thought I'd pass along this guidance from Japan that seems relevant:



(b)(6)

-----Original Appointment-----

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)

Sent: Wednesday, September 18, 2019 5:05 PM

To: Smith, Jessica (CDC/DDID/NCIRD/DBD); Said, Maria; Kesteloot, Kurt; Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Edens, William (Chris) (CDC/DDID/NCIRD/DBD)

Cc: Cooley, Laura A. (CDC/DDID/NCIRD/DBD); James, Allison (CDC arkansas.gov); Lucas, Claressa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD)

Subject: Hot Springs and Water management plans

When: Tuesday, October 1, 2019 2:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).

Where: Skype Meeting

Thanks Maria and Kurt. Let's shoot for 10/1 at 2:00 pm ET, but we can move it if needed.

And please feel free to forward the invitation to Laura Miller or any other folks that you think may be interested in joining (same for the AR DOH side, Allison).

Best regards,

Jessica

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English (United States)

[Find a local number](#)

Conference ID:

[Forgot your dial-in PIN?](#) | [Help](#)

From: Said, Maria <maria_said@nps.gov>

Sent: Wednesday, September 18, 2019 3:01 PM

To: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>

Subject: Re: [EXTERNAL] RE: Hot Springs and Water management plans

Hi Kurt,

I think the call will focus on water management plans -- if you think the park would be interested in being part of that discussion, I think it would be fine. We can add Laura Miller and whoever else might be interested in the calendar invite once we have a day/time.

Maria

On Wed, Sep 18, 2019 at 1:49 PM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:

I'm fairly open that week and look forward to talking more. Should we invite a couple people from the Park?

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

x]

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

On Wed, Sep 18, 2019 at 11:45 AM Said, Maria <maria_said@nps.gov> wrote:

Fantastic.

Tuesday 10/1 is wide open for me too.

The rest of that week I'll be at the IDSA conference and could step out if need be, but it would be less ideal.

Thank you!

Maria

On Wed, Sep 18, 2019 at 11:23 AM Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

Hi Maria,

We're happy to reconvene to discuss WMPs at Hot Springs. Starting tomorrow Troy is going to be traveling internationally, but he's back in the office on the 30th if we could shoot for a time

that week? I'm also looping in Jasen and Claressa in case they can join too, since they bring the ASHRAE perspective and Claressa may be able to speak to the ecology of *Legionella* in this setting.

Right now it looks like Tuesday, 10/1 is wide open for us. Thurs, 10/3 we're free at 3:00 pm and then Friday, 10/4 at 1:00 pm and 3:00 pm ET.

Also, I was hoping we would have heard back from colleagues in Japan by now about any public health recommendations they have for similar settings, but unfortunately we haven't. I do think by the week of the 30th I should be able to do a quick lit review about cases and clusters associated with hot springs and can share any pertinent findings during the call.

Thanks,
Jessica

—
Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NCIRD/DBD/Respiratory Diseases Branch
404.718.5205 lyd7@cdc.gov

From: Said, Maria <maria_said@nps.gov>
Sent: Wednesday, September 18, 2019 9:22 AM
To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Subject: Hot Springs and Water management plans

Hi Laura, Jessica, and Troy,

We (NPS and Arkansas) are trying to figure out the best path forward with the Hot Springs legionella cases. As you know, all the environmental testing has been negative. However, we have had a number of travel-related cases, and, based on Arkansas state data, it looks like there might be increased cases in the Hot Springs area generally compared to the rest of the state -- although these data are still being analyzed, and I would leave it to Arkansas to confirm this.

We also have considered more where the hot spring water is going -- apparently, it does not just go to the Quapaw, but it goes to a number of other concession operated businesses (including another spa) as well businesses outside park property (including a hospital therapeutic pool and at least one other hotel). One action we are considering is sending a letter to those who receive spa water and basically recommending that although we have never identified legionella in the water and don't know of any increased risk, we do know that untreated water does pose a risk for legionella growth, and businesses might want to consider a water management plan. My feeling is that it would be beneficial to them, if we have an additional case, to then be able to clearly describe their water system and the results of some pre-determined parameters (such as temperatures) over time.

If you all are available at any time, I would love to get your thoughts. Some questions I have are:

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- Is a water management plan needed for only places that don't disinfect? I know that water management plans are used by many systems in which chlorine is used, but in this case, in which we don't have any evidence of Legionella growth in the hot spring water, I don't think we can or should point to hot spring water as a particular Legionella risk -- the risk in my mind is just from the fact that it is not disinfected.
- Should any of the water management plans include legionella testing? I think the Quapaw might consider this -- but then what would be the guidance if they get positive results?

I am including Allison, the new EIS officer for Arkansas on the thread. Dirk Haselow is no longer with the state health department.

Thanks for any thoughts on this. Hope you guys are well.
Maria

--

Maria Said, MD, MHS | CDR, U.S. Public Health Service
Epidemiology Branch Chief | Office of Public Health | National Park Service
Address: 1849 C. Street, NW, Room 2543, Mailstop 2560 | Washington, DC 20240
Office Tel: 202-513-7151 | Email: maria_said@nps.gov
Website (public): <https://www.nps.gov/orgs/1878/index.htm>
Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

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Website (internal): <https://sites.google.com/a/nps.gov/in2-protect-and-promote-health/home/disease-surveillance-response>

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Sent: 18 Sep 2019 15:22:46 +0000
To: Said, Maria;Cooley, Laura A. (CDC/DDID/NCIRD/DBD);Ritter, Troy (CDC/DDNID/NCEH/DEHSP);James, Allison (CDC arkansas.gov);Kesteloot, Kurt
Cc: Lucas, Claressa (CDC/DDID/NCIRD/DBD);Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP)
Subject: RE: Hot Springs and Water management plans

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Thanks,
Jessica

—

Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NC RD/D3D/Respiratory Diseases Branch
404.718.5205 | lyd7@cdc.gov

From: Said, Maria <maria_said@nps.gov>
Sent: Wednesday, September 18, 2019 9:22 AM
To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>
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I am including Allison, the new EIS officer for Arkansas on the thread. Dirk Haselow is no longer with the state health department.

Thanks for any thoughts on this. Hope you guys are well.

Maria

From: Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Sent: 18 Sep 2019 14:23:05 +0000
To: Smith, Jessica (CDC/DDID/NCIRD/DBD)
Subject: RE: Hot Springs and Water management plans

Hi Jess,

If you think this can wait until the week of the 30th that would be good. The questions themselves are easy to answer but this entire situation has me mystified. There's a missing piece of this puzzle.

From: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Sent: Wednesday, September 18, 2019 10:07 AM
To: Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>
Subject: FW: Hot Springs and Water management plans

Hey Troy... what do you think about this call? Do you want to shoot for the week of the 30th when you'll be back in the office? Given the ASHRAE angle I think we should invite Jasen and Claressa, too... plus she may be able to speak to some of the ecological questions.

From: Said, Maria <maria_said@nps.gov>
Sent: Wednesday, September 18, 2019 9:22 AM
To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>
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Thanks for any thoughts on this. Hope you guys are well.
Maria

From: Lucas, Claressa (CDC/DDID/NCIRD/DBD)
Sent: 1 Oct 2019 17:01:28 +0000
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Smith, Jessica (CDC/DDID/NCIRD/DBD); Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD); Ritter, Troy (CDC/DDNID/NCEH/DEHSP)
Subject: RE: Hot Springs and Water management plans

(b)(3)

From: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>
Sent: Tuesday, October 1, 2019 12:56 PM
To: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Thanks again.

I think you can (b)(3)
(b)(3)
(b)(3) All things to consider.

Jasen

From: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Sent: Tuesday, October 1, 2019 12:51 PM
To: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Yeah, and there are several more sections I didn't copy and paste that talked (b)(3)
(b)(3)

From: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>
Sent: Tuesday, October 1, 2019 12:49 PM
To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

I think (b)(3)
(b)(3)

(b)(5)

From: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>

Sent: Tuesday, October 1, 2019 12:29 PM

To: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>

Subject: RE: Hot Springs and Water management plans

Super helpful.

(b)(5)

(b)(5)

I wonder if the

(b)(5)

(b)(5)

Are others interpreting this the same?

(b)(5)

(b)(5)

(b)(5)

From: Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>
Sent: Tuesday, October 1, 2019 11:45 AM
To: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Thank you Jess!

Just in case you haven't seen these papers/abstracts, I am forwarding what it seems the most relevant (please see attached).

(b)(5)

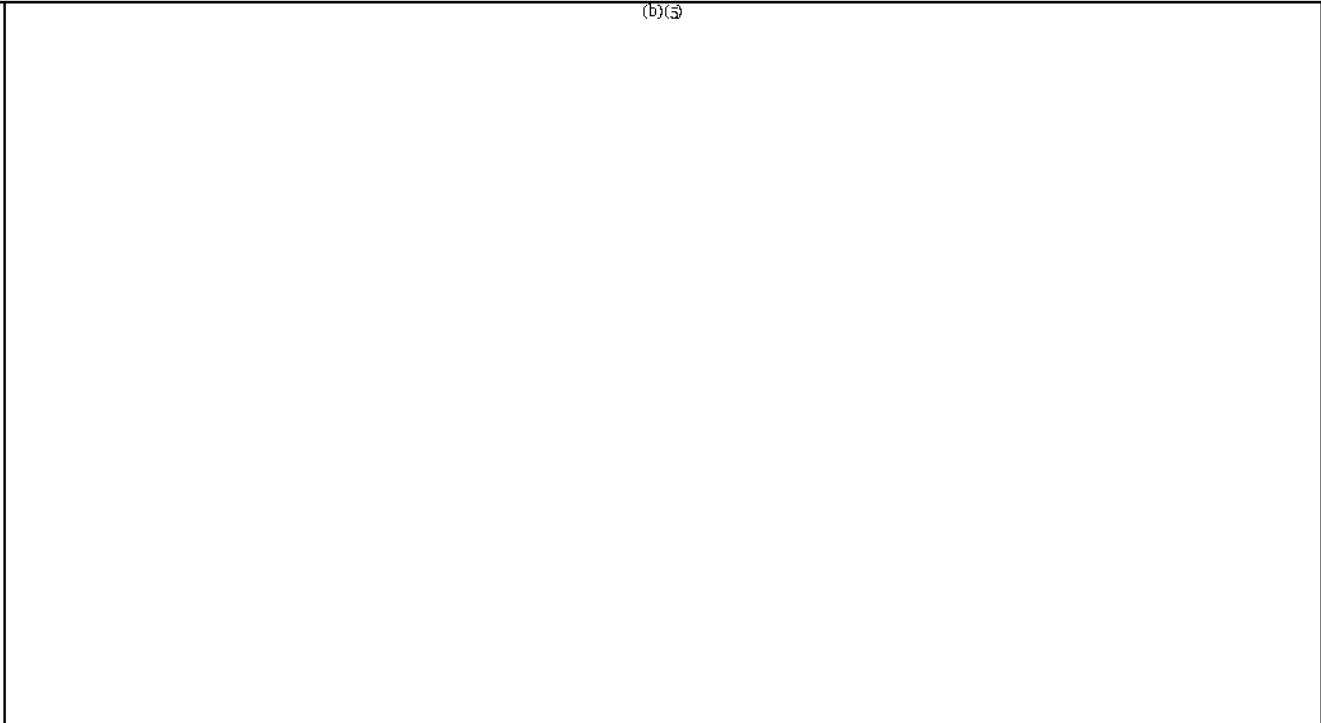
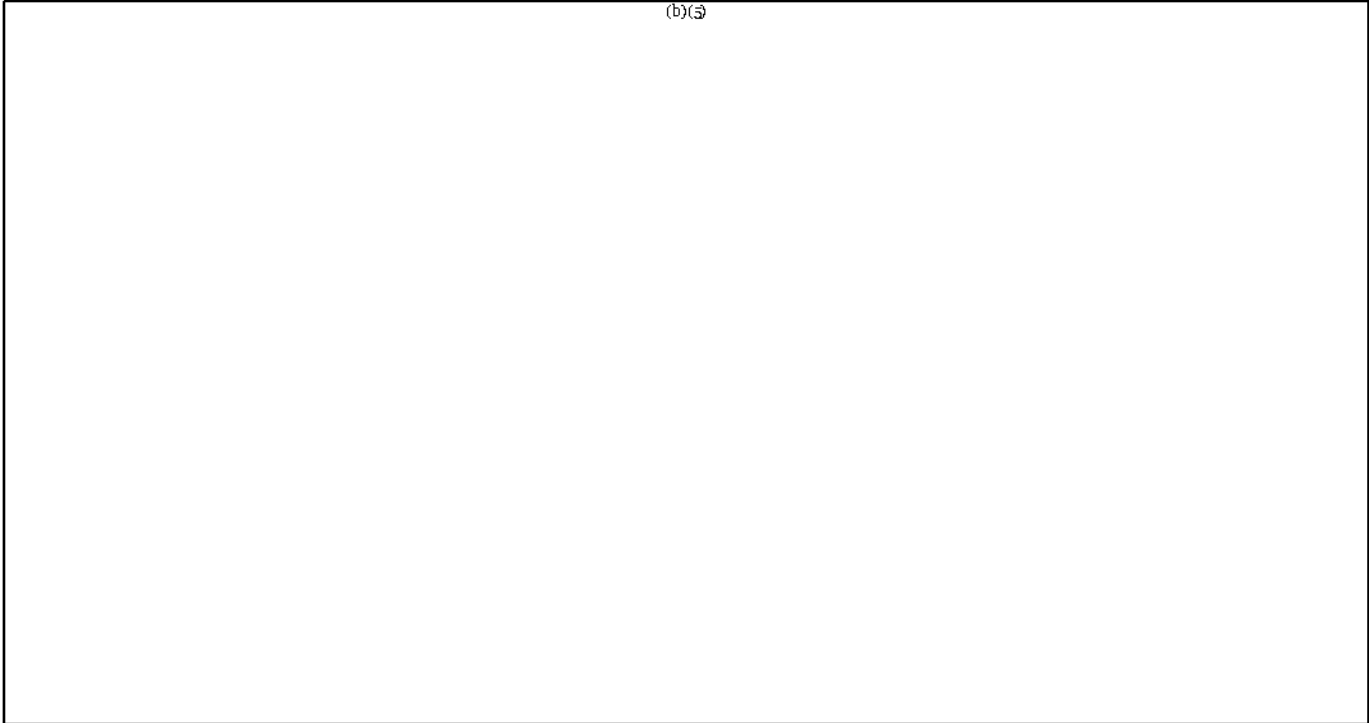
(b)(5)

Thank you,
Natalia

From: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>
Sent: Tuesday, October 1, 2019 10:27 AM

To: Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; Lucas, Claressa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD) <htv2@cdc.gov>
Subject: RE: Hot Springs and Water management plans

Hi all — Before this call at 2 pm today, I thought I'd pass along this guidance from Japan that seems relevant:



-----Original Appointment-----

From: Smith, Jessica (CDC/DDID/NCIRD/DBD)

Sent: Wednesday, September 18, 2019 5:05 PM

To: Smith, Jessica (CDC/DDID/NCIRD/DBD); Said, Maria; Kesteloot, Kurt; Ritter, Troy (CDC/DDNID/NCEH/DEHSP); Edens, William (Chris) (CDC/DDID/NCIRD/DBD)

Cc: Cooley, Laura A. (CDC/DDID/NCIRD/DBD); James, Allison (CDC arkansas.gov); Lucas, Claessa (CDC/DDID/NCIRD/DBD); Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP); Kozak-Muiznieks, Natalia A. (CDC/DDID/NCIRD/DBD)

Subject: Hot Springs and Water management plans

When: Tuesday, October 1, 2019 2:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).

Where: Skype Meeting

Thanks Maria and Kurt. Let's shoot for 10/1 at 2:00 pm ET, but we can move it if needed.

And please feel free to forward the invitation to Laura Miller or any other folks that you think may be interested in joining (same for the AR DOH side, Allison).

Best regards,

Jessica

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(855) 348-8390, (Atlanta Dial-in Conference Region)

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[Forgot your dial-in PIN?](#) | [Help](#)

From: Said, Maria <maria_said@nps.gov>

Sent: Wednesday, September 18, 2019 3:01 PM

To: Kesteloot, Kurt <kurt_kesteloot@nps.gov>

Cc: Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Lucas, Claessa (CDC/DDID/NCIRD/DBD) <chl9@cdc.gov>; Kunz, Jasen M. (CDC/DDNID/NCEH/DEHSP) <izk0@cdc.gov>

Subject: Re: [EXTERNAL] RE: Hot Springs and Water management plans

Hi Kurt,

I think the call will focus on water management plans -- if you think the park would be interested in being part of that discussion, I think it would be fine. We can add Laura Miller and whoever else might be interested in the calendar invite once we have a day/time.

Maria

On Wed, Sep 18, 2019 at 1:49 PM Kesteloot, Kurt <kurt_kesteloot@nps.gov> wrote:

I'm fairly open that week and look forward to talking more. Should we invite a couple people from the Park?

Thank You and Very Respectfully,

Kurt

CDR Kurt Kesteloot, PE, BCEE, USPHS
Supervisory Public Health Consultant, Interior Regions 3-5
National Park Service, Office of Public Health (OPH),
601 Riverfront Drive
Omaha, NE 68102
Office Phone: 1-402-661-1718
Office Fax: 1-402-661-1719
Cell Phone: 1-202-641-0055
Email: Kurt_Kesteloot@nps.gov

✕

"The NPS One Health Network: promoting and protecting the health of all species and the parks that we share." GREEN DOT

On Wed, Sep 18, 2019 at 11:45 AM Said, Maria <maria_said@nps.gov> wrote:

Fantastic.

Tuesday 10/1 is wide open for me too.

The rest of that week I'll be at the IDSA conference and could step out if need be, but it would be less ideal.

Thank you!

Maria

On Wed, Sep 18, 2019 at 11:23 AM Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov> wrote:

Hi Maria,

We're happy to reconvene to discuss WMPs at Hot Springs. Starting tomorrow Troy is going to be traveling internationally, but he's back in the office on the 30th if we could shoot for a time that week? I'm also looping in Jasen and Claressa in case they can join too, since they bring the

ASHRAE perspective and Claressa may be able to speak to the ecology of *Legionella* in this setting.

Right now it looks like Tuesday, 10/1 is wide open for us. Thurs, 10/3 we're free at 3:00 pm and then Friday, 10/4 at 1:00 pm and 3:00 pm ET.

Also, I was hoping we would have heard back from colleagues in Japan by now about any public health recommendations they have for similar settings, but unfortunately we haven't. I do think by the week of the 30th I should be able to do a quick lit review about cases and clusters associated with hot springs and can share any pertinent findings during the call.

Thanks,
Jessica

—

Jessica C. Smith, MPH
Epidemiologist | Centers for Disease Control and Prevention
NCIRD/DBD/Respiratory Diseases Branch
404.718.5205 lyd7@cdc.gov

From: Said, Maria <maria_said@nps.gov>
Sent: Wednesday, September 18, 2019 9:22 AM
To: Cooley, Laura A. (CDC/DDID/NCIRD/DBD) <whz3@cdc.gov>; Smith, Jessica (CDC/DDID/NCIRD/DBD) <lyd7@cdc.gov>; Ritter, Troy (CDC/DDNID/NCEH/DEHSP) <tir4@cdc.gov>; James, Allison (CDC arkansas.gov) <allison.james@arkansas.gov>; Kesteloot, Kurt <kurt_kesteloot@nps.gov>
Subject: Hot Springs and Water management plans

Hi Laura, Jessica, and Troy,

We (NPS and Arkansas) are trying to figure out the best path forward with the Hot Springs legionella cases. As you know, all the environmental testing has been negative. However, we have had a number of travel-related cases, and, based on Arkansas state data, it looks like there might be increased cases in the Hot Springs area generally compared to the rest of the state -- although these data are still being analyzed, and I would leave it to Arkansas to confirm this.

We also have considered more where the hot spring water is going -- apparently, it does not just go to the Quapaw, but it goes to a number of other concession operated businesses (including another spa) as well businesses outside park property (including a hospital therapeutic pool and at least one other hotel). One action we are considering is sending a letter to those who receive spa water and basically recommending that although we have never identified legionella in the water and don't know of any increased risk, we do know that untreated water does pose a risk for legionella growth, and businesses might want to consider a water management plan. My feeling is that it would be beneficial to them, if we have an additional case, to then be able to clearly describe their water system and the results of some pre-determined parameters (such as temperatures) over time.