CALIFORNIA'S DRAFT CRITERIA FOR GROUNDWATER RECHARGE WITH RECLAIMED WATER & EMERGING CONTAMINANT CONTROL

(as of 9/12/08)

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CDPH DDWEM Drinking Water Program

- Reviews recycled water proposals for compliance with Title 22 Criteria
- Provides requirements and recommendations to RWQCB for recycled water permits
- Coordinates with other agencies
- Interfaces with recycled water industry
- Reviews new and emerging technologies
- Collects fees from project applicants for CDPH reviews

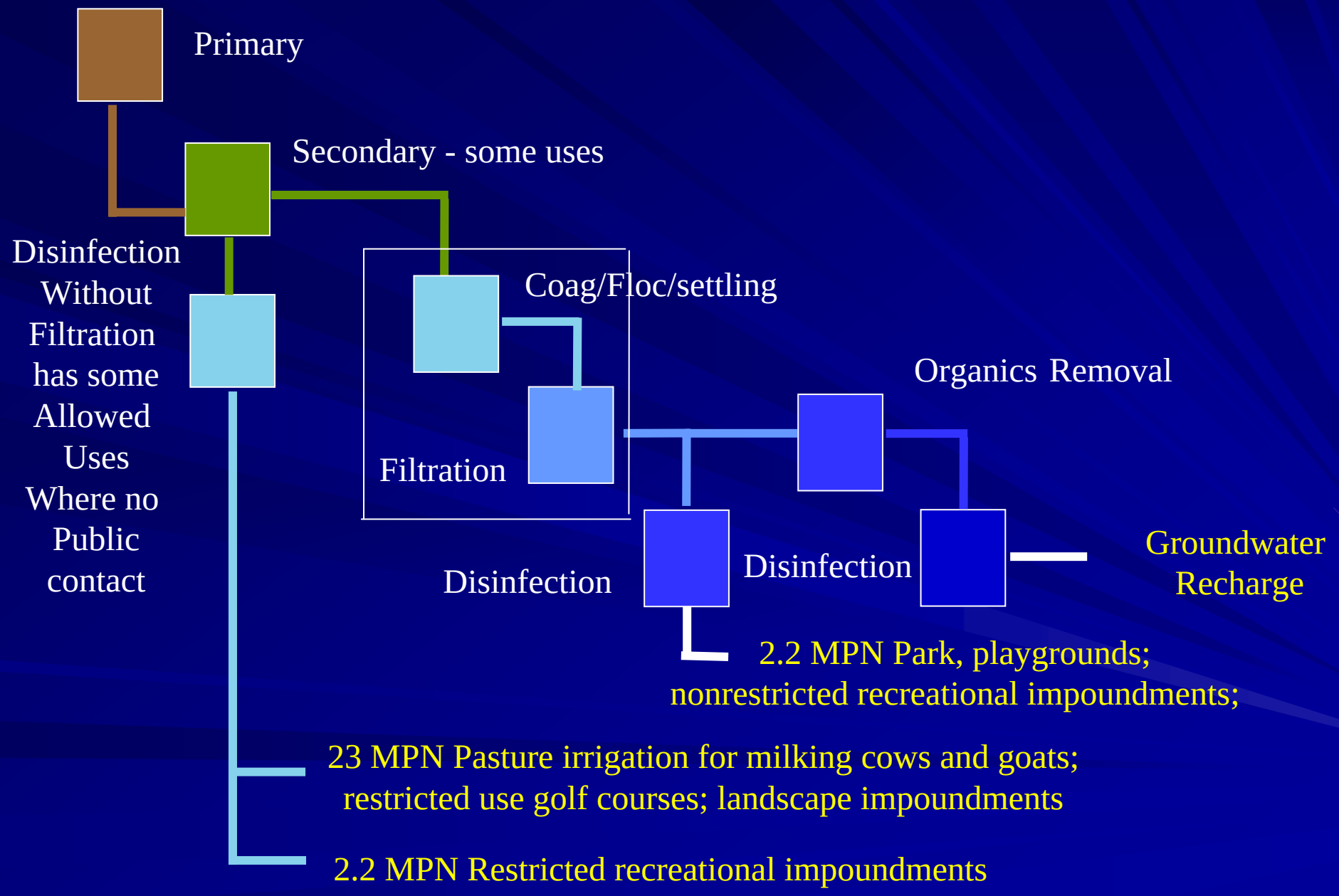
CDPH – Division of Drinking Water and Environmental Management

- Regulates public water systems
- Sets standards for wastewater reuse to protect public health
  - "Water Recycling Criteria" in Title 22 of California Code of Regulations
- RWQCBs have the permitting and ongoing oversight authority of "Groundwater Recharge Reuse Project (GRRP)"

CDPH – SWRCB - RWQCB

- Due to the potential for confusion and duplication of effort between CDPH & RWQCBs, CDPH & SWRCB signed a Memorandum of Agreement (MOA) in 1996
- MOA delineates responsibilities of each agency in review and approval of RW projects
- CDPH requirements for permit approval are to be incorporated in RWQCB permit
- CDPH will meet with RWQCB staff and attend RWQCB hearings as necessary to explain any CDPH requirements or recommendations
- The two agencies agree to meet and try to resolve any differences

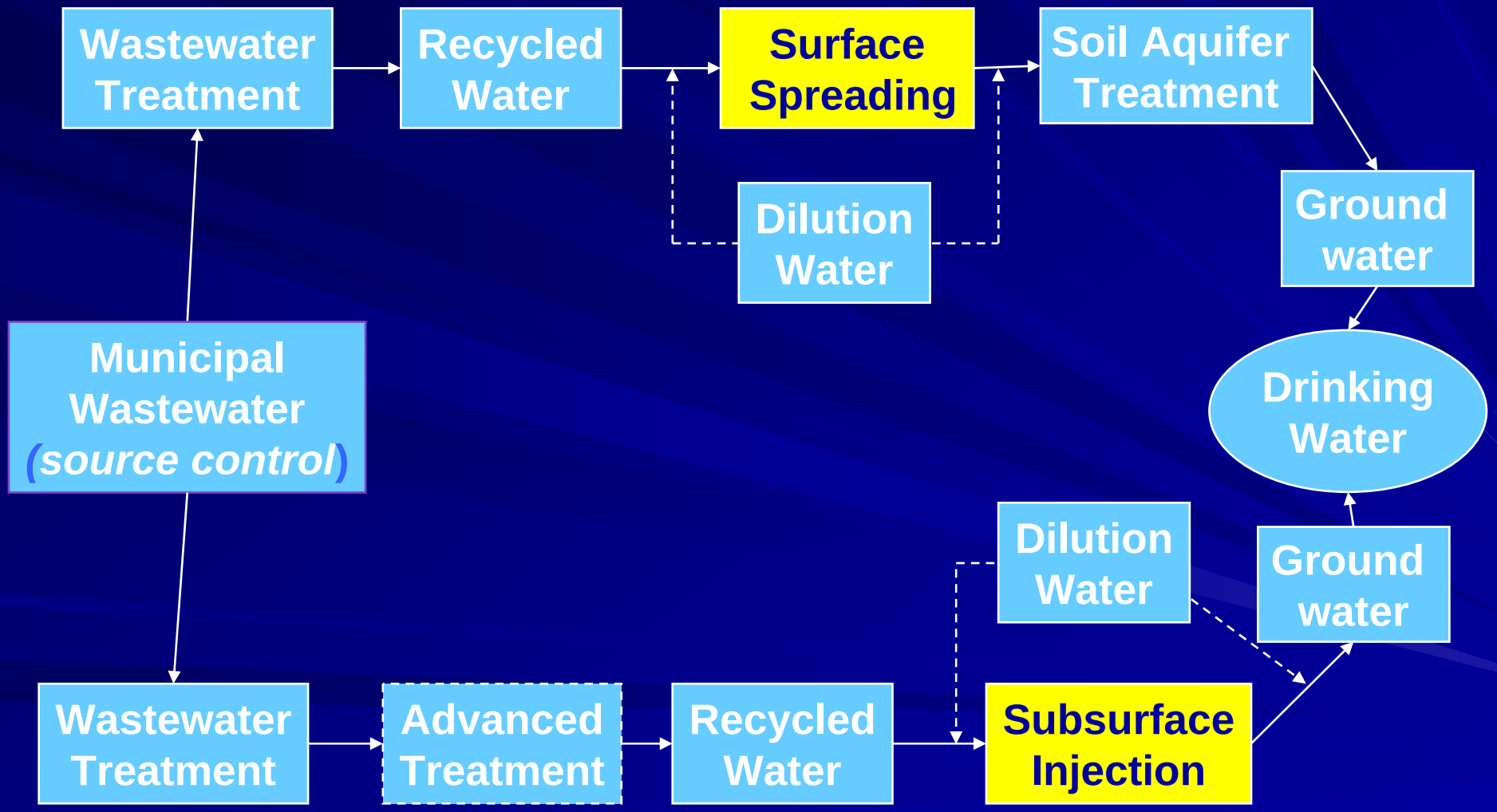
Source Control



Disinfection

- 7-day median of 2.2 total coliform MPN/100mL
- Plus achieve at least:
  - A chlorine disinfection process following filtration that provides a CT of not < 450 at all times with a modal contact time of at least 90 minutes
  - A disinfection process that, when combined with the filtration process, has been demonstrated to inactivate and/or remove 99.999 percent of the plaque-forming units of F-specific bacteriophage MS2, or polio virus
    - UV
    - Pasteurization
    - Ozonation in future?

Wastewater to Drinking Water through Groundwater Recharge Via Two Paths



CA Groundwater Recharge Projects

SURFACE APPLICATION

- Montebello Forebay – County Sanitation Districts of Los Angeles County
- Inland Empire Utilities Agency
- Orange County Water District—GWRS

SUBSURFACE APPLICATION

- West Basin MWD
- Harbor Recycling Project
- Alamitos Barrier
- Orange County Water District—GWRS

Overview of the Draft Recharge Criteria

- "Recycled Municipal Wastewater" = primarily from domestic sewage vs. industrial
- Aquifer designated as a drinking water source
- Indirect potable reuse
  - Effective natural barrier
  - Time to identify and respond to problems
- Multiple barriers for each type of contaminants
- Ongoing monitoring program in recycled water and groundwater
- Treatment processes required
- Source water control

Criteria Goals

- Address spreading basins & subsurface application (direct injection)
- Protect the beneficial uses of each separate aquifer
  - Wellhead treatment not an option
  - blending of 2 aquifers is not acceptable for compliance

    (e.g. averaging 10% & 30% RWC to get 20%)
- Must make a finding that the project will not degrade any groundwater aquifers
- Maintain public, policy maker, and government agency confidence

Public Hearing

- CDPH will hold a public hearing for each GRRP prior to submitting its recommendations for the
  - initial permit to the RWQCB and
  - at any time an increase in RWC is proposed

Monitoring Wells

- At a location where the GRRP's recharge water has been retained in the saturated zone for 1-3 months, but will take at least 3 months before reaching the nearest domestic water supply well,

<u>and</u>

- At an additional point or points between the application facility and the nearest downgradient domestic water supply well

Control of Pathogenic Microorganisms

- Disinfected tertiary recycled water
- Retained underground for a minimum of 6 months prior to extraction for use as a drinking water supply
- GRRP must demonstrate that the minimum retention time has been met
- A tracer study utilizing an added tracer (e.g. sulfur hexafluoride)
  - prior to the end of the third month of operation,
  - under hydraulic conditions representative of normal operations.

Siting to Control Pathogenic Microorganisms

- “. . . siting a GRRP location during project planning,

  each GRRP shall be located at a distance from drinking water supply wells that ensures that one of the estimated retention times in Table 60320.010-A is met, as indicated by the corresponding method used to determine the estimated retention times.”

Siting to Control Pathogenic Microorganisms

- i.e., until a GRRP has demonstrated compliance with the 6-month tracer test,
- Use one of the estimated retention times in Table 60320.010-A
  - (9,12, or 24 months)

  with the corresponding method to estimate retention time
- Methods used to estimate the distance the groundwater travels shall be approved by CDPH

Comparison of Methods to Determine Retention Time to drinking water wells

Planning and Engineering Report Effort vs. Retention Time				
Method	General Accuracy	General Level of Effort	Retention Time (months)	Safety Factor
Formula (Darcy's)	Poor	some info on aquifer	24	4
3-D model	Fair	lot of info on aquifer	12	2
Intrinsic Tracer	Better	sampling of existing indicators	9	1.5
Added Tracer	Desired	track added tracer	6	1.0

How to determine if GRRP location is far enough away from drinking water wells

- There are 4 types of methods a proponent can propose in the engineering report. They can range between very accurate to a rough estimate. They are listed below in order of accuracy and effort needed:

1. tracer study using an added tracer chemical (e.g. sulfur hexafluoride) based on being able to detect a T_2 (i.e. the time for 2% of tracer concentration to reach the endpoint)

More Methods for determining GRRP locations with respect to drinking water wells

2. tracer study utilizing an intrinsic tracer (existing parameter that is an indicator in effluent, such as TDS) based on T_{10}
3. develop and calibrate 3-D numerical model to predict distance

   (i.e. calibrated finite element or finite difference models using validated & verified computer codes such as Modflow, Feflow, Sutra, Femwater, etc. – these 4 are public domain models that are commonly used)
4. develop and justify an analytical formula to predict distance
   - Darcy's Equation
     - Should do some field work to determine porosity
     - Hydraulic conductivity constant of aquifer
     - Hydraulic gradient of flow

Ultimately Need a Tracer Study

- If not performed already, within 3 months of commencing operation, the GRRP must initiate an added tracer study to verify travel time from the GRRP to the first monitoring well.
- continue to monitor the tracer, to the nearest downgradient drinking water well, until 6 months retention time has been demonstrated.
- Of course, if it shows it is >6 months retention time to the monitoring well, can stop monitoring.
- if changes in hydrogeological or climatic conditions occur afterward, CDPH may require the GRRP to demonstrate retention times required are being met.

Planning Tool For Proponent

- For instance, some aquifers may have the characteristics where a Darcy's formula calculation may indicate 2+ years of travel time to nearest domestic well
- CDPH will carefully review assumptions and basis for them in engineering report
- Eventually require tracer test after project is initiated
- 24 months should be conservative enough, but if not, proponent can mitigate impact

Planning Tool For Counties

- Proponent proposes distance in engr. report
- One setback distance that would apply to all aquifers was too hard to justify because of varying characteristics
- If Darcy's formula used, 24 months travel time should yield a conservative setback to nearest domestic well
- CDPH will evaluate method in engineering report
- Initial distance can be used by county until eventual tracer test after project is initiated
- If setback not enough, proponent must mitigate impact (CDPH approved plan that provides an alternative source of domestic water supply to any user of a producing drinking water source)

Nitrogen Compound Control

- Method 1 relies on
  - 5 mg/L total N as an average
- Method 2 relies on
  - 10 mg/L total N as a maximum
  - samples analyzed for Total N, nitrate, nitrite, ammonia, organic nitrogen, DO, and BOD
  - A set of limits determined for the specific GRRP
  - as necessary to prevent reduction of NO_3 to NO_2
- Method 3 relies on:
  - MCLs for nitrate and nitrite
  - based on historic recharge > 20 yrs

Nitrogen Control Method 1

- Compliance point and monitoring•
  - Anywhere representative of recycled water or recharge water (i.e. including in or above the mound)•
  - Samples analyzed for total nitrogen•
  - Reduced monitoring available
- Standard - 5 mg/L total N as an average
- Frequency of sampling - 2 per week
- Consequence of failure•
  - Investigate, correct, and notify if the average of two consecutive samples >5 mg/L •
  - Suspend application of recycled municipal wastewater if the 4-week average of all samples >5 mg/L
- Rationale - Method 1 relies on such a low limit for the total N in the recycled municipal wastewater that the chance that the NO2 or NO3 MCL could be exceeded is minute.

Nitrogen Control Method 2

- Compliance point and monitoring
  - representative of recycled water or recharge (i.e. prior to surface or subsurface application or prior to reaching the GW table)
  - analyze for TN, nitrate, nitrite, ammonia, org. N, DO, and BOD
  - A groundwater sample analyzed for DO
  - Reduced monitoring available
- Standard - 10 mg/L total nitrogen and limits established in the engineering report for other constituents
- Frequency of sampling - As established by CDPH and specified in the operations plan
- Consequence of failure•
  - Investigate, correct, and notify if the average of 2 consecutive samples >10 mg/L TN standard or exceeds standard for other constituents
  - Suspend application of recycled municipal wastewater if the 4-week average of all samples >10 mg/L
- Rationale - Method 2 relies on a low limit for the total N in the recycled that the chance that a MCL could be exceeded is low

Nitrogen Control Method 3

- Compliance point and monitoring
  - Only for projects in operation for ≥ 20 years
  - Groundwater downgradient of the recharge area
- Standard - MCLs for nitrate and nitrite
- Frequency of sampling –
  - Specified in the engineering report and operations plan.
  - Relatively frequent monitoring at locations between the recharge area and downgradient domestic wells is required.
- Consequence of failure
  - Notify the Department and RWQCB if > MCLs
  - Suspend surface and subsurface application unless demonstrated that the groundwater no longer exceeds the MCLs.
- Rationale - Method 3 relies on:
  1. A demonstration that historic recharge with water containing comparable levels of nitrogen has not caused a problem,
  2. Evidence that recharge water can be tracked and monitored throughout the flow path, and
  3. Monitoring to show that the MCLs for NO2 and NO3 are met in the groundwater.

Source Water Control

- An industrial pretreatment and pollutant source control program that includes
  - an assessment of the fate of Department-specified contaminants,
  - contaminant source investigations and contaminant monitoring
  - an outreach program to industrial, commercial, and residential for the purpose of managing and minimizing the discharge of contaminants
  - an up-to-date inventory of contaminants discharged into the wastewater collection system so that new contaminants of concern can be readily evaluated

http://www.nodrugsdownthedrain.org/disposal.html

- Instructions for disposing of unwanted pharmaceuticals may vary by location but in the City of Riverside the approved method is to dispose of them in the trash. . . . Flushing is no longer the recommended disposal method; it can have adverse effects on our environment.

- **How should I dispose of my unwanted medication?** Trashing medicine is a better option than flushing. However, precautions must be taken to ensure the safety of children and animals.

- **LIQUIDS -** Empty liquid medication onto absorbent paper towels or rags and dispose of with regular trash.

- **PROPELLANT INHALER -** Empty container by expelling all propellant. Dispose of small empty cylinder in trash.

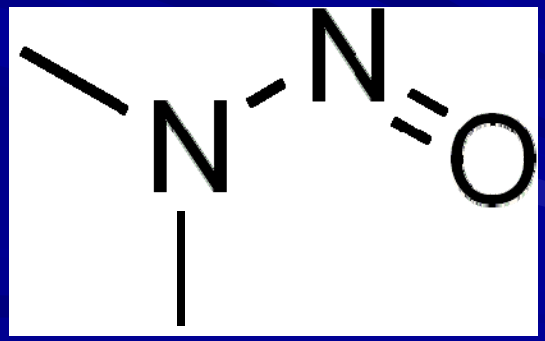
- **PILLS -** Capsules and tablets should be made unusable and unattractive by wetting, breaking and crushing. The remains should be placed in the original childproof container **with all your personal information removed**, sealed with tape and tossed in the trash. Or, another option is to mix the medication with decaying food, used coffee grounds, or kitty litter for disposal with your household trash.

Chemical Contaminant Classes

- Regulated contaminants (MCLs)
  - Known, with regard to health effects (PHGs), detection, treatment technologies
- Unregulated contaminants with notification levels
  - Health effects known, but not to the extent of regulated ones
- Emerging contaminants
  - Unknown with regard to detection, treatment, human health effects at environmental concentrations
  - Often information available about effects at high levels (drugs), or ecological effects (endocrine disruptors)

Regulated Chemical Control

- Drinking Water Standards
  - Primary and
  - Secondary
- Potential future Maximum Contaminant Levels
  - chromium-6,
  - 1,2,3-trichloropropane,
  - NDMA?



NDMA

MCL Development

- A new MCL comes from a public health concern, a federal regulation, or a state law
- Office of Environmental Health Hazard Assessment (OEHHA) does risk assessments (public health goals=PHGs) for existing MCLs, federal MCLs (new/revised), and emerging chemicals
- A risk assessment is a comprehensive literature review and analysis of a contaminant.

After Public Health Goal Set

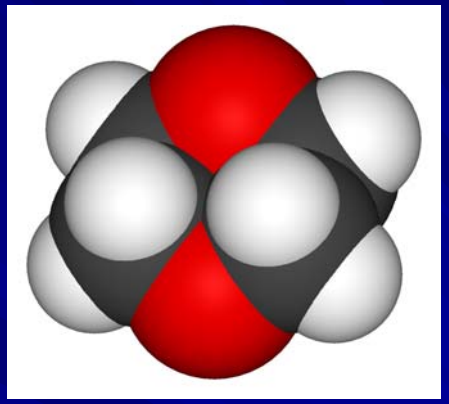
- Review
  - occurrence,
  - feasibility
  - costs of analysis and monitoring
  - cost of removal
- Conduct cost-benefit analysis for possible MCLs
- Process takes a long time due to development and lengthy adoption period

GWR General Approach for the Unregulated Chemicals

- Monitor for Regulated Contaminants, plus NLs & Priority Pollutants
- But too many compounds to monitor for everything else
- Plus, this is a dynamic situation
  - Industrial practices change
  - Pharmaceutical prescription preferences change
  - Public perceptions change

Unregulated contaminants with Notification Levels (NLs)

- Includes chemicals such as
  - boron,
  - chlorate,
  - NDMA,
  - 1,2,3-trichloropropane,
  - formaldehyde,
  - vanadium and



1,4-dioxane

- Exceeding a NL requires notification of the governing body of the local agency
- CDPH requires these chemicals because they have either been detected in the recycled water or shown to be possibly present in the sewage.

Other Chemical Concerns

- Gross organic matter (TOC)
- **TOC max =** $\frac{\mathbf{0.5\ mg/L}}{\mathbf{RWC_{proposed}}}$
- $RWC_{proposed}$ is the proposed max. RWC
- "Recycled water contribution (RWC)" means the quantity of recycled municipal wastewater applied at the GRRP,

  divided by the sum of the recycled municipal wastewater applied at the GRRP and

  diluent water meeting the requirements of section 60320.035."

Recycled Water Contribution (RWC)

- Example of RWC
  - 1000 acre-ft of recycled water combined with 4000 acre-ft of diluent water =

    1000/(1000 + 4000) = 0.2 or 20%

  - 5000 acre-ft of recycled water combined with 5000 acre-ft of diluent water =
  - 5000/(5000 + 5000) = 0.5 or 50%

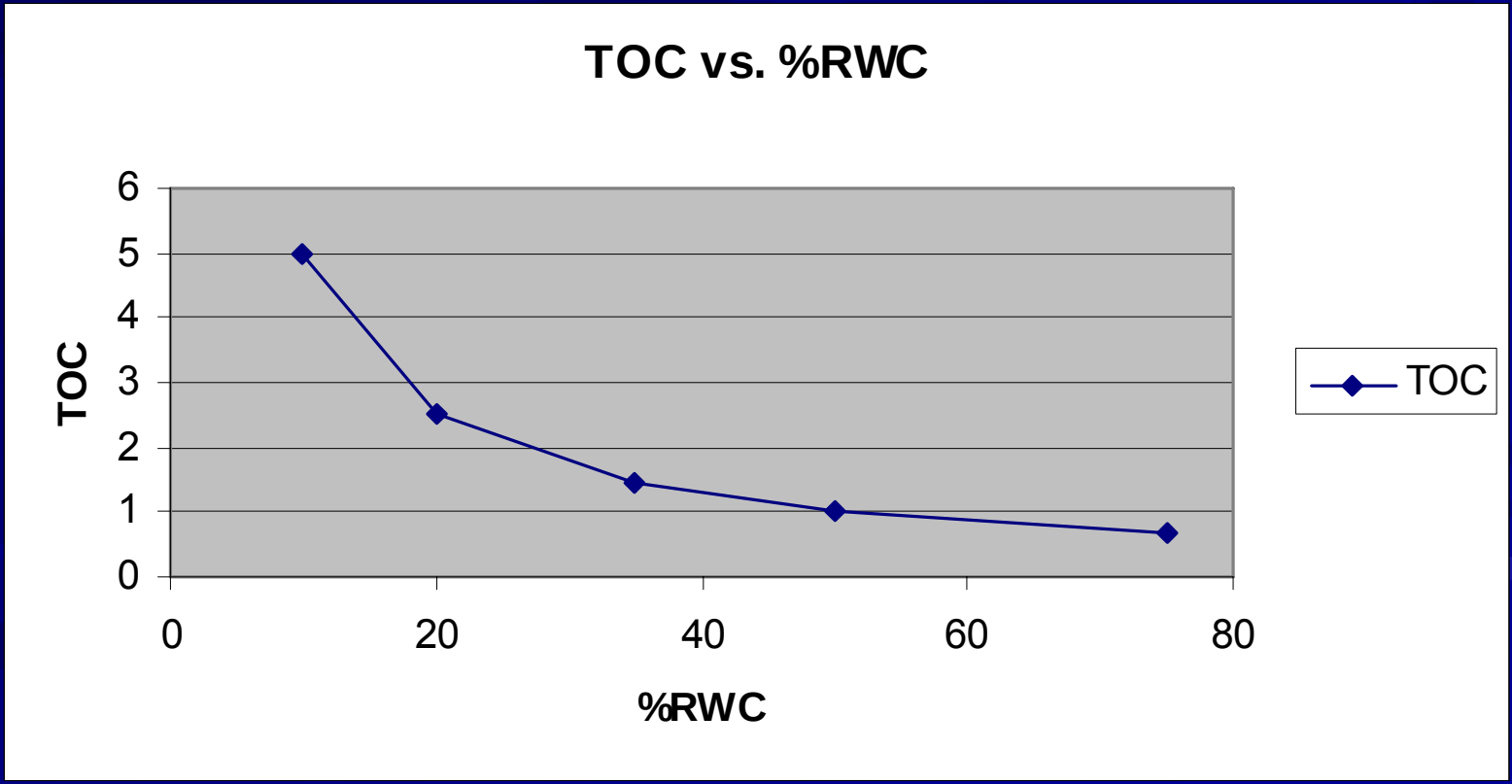
  - NOTE – RWC is calculated on a 60 month average

Recycled Water Contribution (RWC)

- **TOC max =** $\frac{\textbf{0.5 mg/L}}{\textbf{RWC}_{\textbf{proposed}}}$
- Example
  - RWC = 10% or 0.10; TOC < 5.0 mg/l
  - RWC = 20% or 0.20; TOC < 2.5 mg/l
  - RWC = 35% or 0.35; TOC < 1.43 mg/l
  - RWC = 50% or 0.50; TOC < 1.0 mg/l
  - RWC = 75% or 0.75; TOC < 0.67 mg/l
- NOTE: TOC is calculated on a 20 week average

Recycled Water Contribution (RWC)

RWC = 10% or 0.10; TOC < 5.0 mg/l
RWC = 20% or 0.20; TOC < 2.5 mg/l
RWC = 35% or 0.35; TOC < 1.43 mg/l
RWC = 50% or 0.50; TOC < 1.0 mg/l
RWC = 75% or 0.75; TOC < 0.67 mg/l



TOC Monitoring Options

1. "For filtered wastewater, unless subsequently treated with reverse osmosis, two 24-hour composite samples a week, taken at least three days apart.
2. For recycled municipal wastewater, at least one 24-hour composite sample each week prior to recharge, or . . ."

TOC Monitoring Options-2

3. For surface application, at least one sample each week in a manner yielding TOC values representative of the recycled municipal wastewater TOC after infiltration and percolation, and not influenced by diluent water, native groundwater, or other source of dilution as determined by:
   A. measuring undiluted percolating recycled municipal wastewater,
   B. measuring diluted percolating recycled municipal wastewater and adjusting the value for the diluent water effect, or
   C. using recharge demonstration studies to develop a soil treatment factor that can be applied weekly to recycled municipal wastewater measurements leaving the treatment plant."

Diluent Water

- Meet the requirements of section 60320.035
- Examples are
  - raw surface water,
  - groundwater,
  - stormwater
- Conduct a source water evaluation per Cal/NV AWWA watershed sanitary survey handbook of the diluent water for Department review and approval, including:

1. a description of the source of the diluent water,
2. delineation of the origin & extent of the water,
3. the susceptibility to contamination,
4. the identification of known or potential contaminants,
5. an inventory of the potential sources of diluent water contamination

Diluent Water Monitoring

(a) Monitor the diluent water quarterly for nitrate and nitrite

(b) a Department-approved water quality monitoring plan for the purpose of demonstrating that the diluent water meets Department specified primary MCLs and notification levels

1. Monitoring of any additional constituents listed in section 62320.047 (e.g. NLs & EDCs), based on the source water evaluation;
2. Actions to be taken in the event of non-compliance with a primary MCL or failing to meet a notification level.

Running Monthly Average RWC

- calculate running monthly average RWC based on the
  - total volume of the recycled municipal wastewater
  - and diluent water
  - for the preceding 60 calendar months
- The initial maximum RWC will be based on
  - the CDPH's review of the engineering report &
  - information obtained as a result of the public hearing,
  - but shall not exceed 0.20 for surface application
  - or 0.50 for subsurface application projects
  - or 0.50 for surface application projects with RO

Advanced Treatment

- Treatment processes are required for that portion of the recycled wastewater stream needing additional treatment to meet the TOC limit, = $\frac{0.5\ mg/L}{RWC_{permited}}$
  - provide reverse osmosis treatment
  - advanced oxidation treatment to provide treatment equivalent to
    - a 1.2 log NDMA reduction <u>and</u>
    - a 0.5 log 1.4-dioxane reduction
    - UV / H_2O_2 or Ozone / H_2O_2

Example RWC

- Say proposing RO to increase RWC
- Assume TOC in the permeate = 0.2
- What % of the effluent needs RO?

equation is 0.5 / RWC				
recalcitrant TOC	1.4	1.4	1.4	1.4
RWC proposed	0.357	0.4	0.45	0.5
TOC to meet EQ.	1.400	1.25	1.111	1
% RW needing RO	0.0%	12.5%	24.2%	33.3%

GWR Criteria Operations Control

- During first year of operation, GRRP operation of all treatment processes shall be optimized to reduce contaminant levels, including regulated and unregulated contaminants
- Update operations plan based on above optimization practices

Engineering Report

- Description of GRRP, proposed RWC, anticipated TOC
- Prepared by registered engineer in conjunction with a registered geologist
- Investigation and evaluation of GRRP, (hydrogeological)
- Impacts on existing and potential uses of impacted GW basin
- Proposed means for compliance with GWR regs and water recycling criteria
- Operations Plan
- Advisory Panel
- Periodic Updates

Contemporary concerns

- Indicators of the presence of municipal wastewater as specified by CDPH
- Purpose
  - Such monitoring is not for compliance, but for informational use only.
  - This will be useful in addressing public perception about the safety of recharge projects.
- Project proponent proposes list in engineering report

Emerging Contaminants

- CDPH at this time <u>does not</u> recommend specific chemicals.
- However, GRRPs should propose a monitoring program of these categories of contaminants (including surrogates or specific chemicals indicators)
- There are many lists out there
- Shane Snyder's work @ So. NV & WRF 3085
- Recent work such as WRF 03-014, Drewes, et al
- Current developments for WRF-05-005

Occurrence

Shane Snyder created an occurrence list from 23 source waters:

dilantin = 91%
meprobamate = 91%
sulfamethoxazole = 91%
atrazine = 87%
carbamazepine = 83%
gemfibrozil = 78%
atenolol = 74%
trimethoprin = 74%
estrone = 74%
naproxen = 70%
TCEP = 65%

Intermediate to Poor Removal via Soil Aquifer Treatment

- Recommended as "surrogates" by Drewes & Snyder
  - **Carbamazepine:** most frequently detected pharmaceutical in numerous studies. It appears to be resistant to treatment removal technologies and tends not to break down in the environment. Evidence of carcinogenicity and developmental toxicity.
  - **Sulfamethoxazole:** most frequently detected antibiotic and possible concerns with antibiotic resistance
  - **Dilantin:** anticonvulsant; frequently detected

Shane Snyder found occurrence in 3 reuse water samples after RO and AOP

- dilantin < 0.50 ng/L
- meprobamate ranged from < 0.25 - 0.58 ng/L
- sulfamethoxazole < 0.25 ng/L
- atrazine < 0.25 ng/L
- carbamazepine < 0.50 ng/L
- gemfibrozil ranged from < 0.25 - 0.62 ng/L
- atenolol ranged from 1.7 to 2.6 ng/L
- trimethoprin ranged from 0.41 - 0.60 ng/L

History of Endnote 5

- First developed in 2003 in response to questions raised at public hearings
- some considerations:
  - a) occurrence
  - b) public interest
  - c) high use by public
  - d) removal via treatment
- Never intended to be THE LIST
- Specifics depend on the individual engineering report and characteristics of the groundwater basin.

Future of Endnote 5

- None of the endnotes will be in the final regulation.
- Are just guidance on current thinking.
- Drewes and Snyder are recommending "surrogates" based upon some considerations:
  - a) occurrence in source water;
  - b) occurrence in reuse water;
  - c) removal via soil aquifer treatment (SAT);
  - d) removal via RO and disinfection
- Many are removed effectively by RO, if Molecular Weight is > 200 g/mol
- NDMA has a 74 MW and requires UV

Hormones

- In our most recent draft of the groundwater recharge with recycled water reg, Endnote 5 will probably not recommend any specific chemicals
- Hormones - chemicals that represent either female or male hormones,
  - purported low-dose effects
  - public interest

Industrial Endocrine Disruptors

- "Industrial" endocrine disruptors
- Canada is considering a standard for bisphenol A - purported low-dose effects
- Bill proposed on bisphenol A
- In the marketplace, seeing water bottles baring the sticker “no BPA”

Pharmaceuticals

- Chemicals <u>such as those</u>
  - leading list of those prescribed to humans
  - frequently detected pharmaceutical in numerous studies
  - relatively resistant to treatment removal technologies
  - that tend not to break down in the environment
  - evidence of carcinogenicity
  - evidence of developmental or other toxicity
  - possible concerns with antibiotic resistance

Other Pharmaceuticals

- May vary by locality
- chemicals <u>such as</u>
  - analgesics
  - pain treatment
    - highly prescribed and over the counter sales leaders
  - drugs for lowering blood cholesterol, fats
  - antibiotics
  - antibacterials
  - anticonvulsant
  - anti-anxiety agents

Personal Care Products

- investigate chemicals such as
  - those frequently detected
  - relatively resistant to treatment removal
  - consumer/household bactericidal soap
  - cosmetics
  - skin care
  - insect repellants

PHARMACEUTICALS & PERSONAL CARE PRODUCTS

Chemicals	Possible Uses or Sources	Typical Dose/Levels In Drinking Water	Number of Gallons of Recycled Water Consumed to Achieve One Typical Dose
Acetaminophen	cold and flu medications, such as Tylenol, Panadol, aspirin	325 mg per tablet (Tylenol regular); typical concentration in drinking water: 110 ppt**	2,000,000
Caffeine	beverages	100 mg in 8 oz cup of coffee	900,000
Carbamazepine	anticonvulsant and mood stabilizing drug, such as Tegretol, Biston	200 mg per tablet (Tegretol)	200,000
N,N-diethyl-meta-toluamide (DEET)	mosquito repellent	typical concentration in drinking water: 60 ppt**	Recent assessment shows minimal risk to human health from similar exposures in drinking water**
Esterone	hormone		natural hormone
Estradiol	hormone	0.5-2 mg per Estrace@ tablet	300,000
Fluoxetine	antidepressant, such as FLUOXETINE (Prozac®)	10-60 mg per capsule	100,000
Gemfibrozil*	lipid reduction drug	600 mg per dose	700,000
Ibuprofen	used for relief of fever and headache; anti-inflammatory	200 mg per tablet	3,500,000
Sulfamethoxazole	medications for malaria, conjunctivitis, toxoplasmosis, and urinary tract infections	500 mg per tablet	1,600,000
Triclosan	antibacterial soap, cleaning supplies	typical concentration in drinking water: 140 ppt**	Recent assessment shows minimal risk to human health from similar exposures in drinking water**

**Diann L. Blanset, Junfeng (Jim) Zhang, Mark G. Robson, "Probabilistic Estimates of Lifetime Daily Doses from Consumption of Drinking Water Containing Trace Levels of N,N-diethyl-meta-toluamide (DEET), Triclosan, or Acetaminophen and the Associated Risk to Human Health," Human and Ecological Risk Assessment, Volume 13, Issue 3, May 2007, pp. 615-631.

Other chemicals such as

- Iodinated contrast media
  - medical imaging
  - X-ray
- fire retardants
  - frequently detected
  - resistant to removal via AOP

Hormones, Pharmaceuticals, Endocrine Disruptors, Personal Care Products

- There are no drinking water standards for many of these emerging contaminants and no standards are anticipated in the near future.
- In addition, consistent, validated, standardized, approved, analytical methods not generally available.

Research Needs

To address concerns, we need:

- Laboratory methods that are commercially available and inexpensive
- Demonstration that treatment technologies efficiently remove them from treated wastewater to be used for indirect potable reuse
- We need to have confidence that adverse health effects are not likely from potential long-term, low-level exposure to diluted emerging contaminants
- cumulative and synergistic effects?

Questions?

Refer to draft recharge regs
dated August 5, 2008 on our website

http://ww2.cdph.ca.gov/healthinfo/environhealth/water/Pages/Waterrecycling.aspx